U.S. Department of the Interior
Bureau of Land Management

Willow Master Development Plan

Environmental Impact Statement

FINAL

Volume 7: Appendix E.17 through J

August 2020

Prepared by:
U.S. Department of the Interior
Bureau of Land Management

In Cooperation with:
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Native Village of Nuiqsut
Iñupiat Community of the Arctic Slope
City of Nuiqsut
North Slope Borough
State of Alaska

Estimated Total Costs Associated with Developing and Producing this EIS: $6,668,400

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Appendix E.17
Environmental Justice Technical Appendix

There is no technical appendix for this resource

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Appendix E.18
Public Health Technical Appendix

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List of Acronyms

BLM	Bureau of Land Management
DHSS	Alaska Department of Health and Social Services
HEC	health effects category
NSB	North Slope Borough

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1.0 PUBLIC HEALTH

Table E.18.1 describes the health effects categories (HECs) and Table E.18.2 provides an overview of the technical guidance for evaluating health impacts from resource development used to inform the health impact analysis. Guidance for evaluation comes from:

- Alaska Department of Health and Social Services (DHSS), *Alaska Health Impact Analysis Technical Guidance* (2015)
- North Slope Borough (NSB), *Health Impact Assessment for Natural Resource Development in Alaska Collaborative Guidance* (2015)
- Bureau of Land Management (BLM), *National Petroleum Reserve in Alaska Integrated Activity Plan/Environmental Impact Statement* (2012) health effects analysis

Table E.18.1. Health Effects Category Descriptions

Health Effects Category	Description
HEC1: Social determinants of health	Economic status, educational status, social support systems, employment status, mental health, maternal and child health, substance use, social exclusion, psychosocial distress, historical trauma, and family dynamics
HEC2: Accidents and injuries	Intentional and unintentional injuries with fatal and nonfatal results; traffic patterns, alcohol involvement, emergency services availability, presence of law enforcement, and presence of prevention programs
HEC3: Exposure to potentially hazardous materials	Documented illnesses or exacerbation of illnesses commonly associated with pollutants through inhalation, ingestion, or physical contact
HEC4: Food, nutrition, and subsistence activities	Nutrient levels, malnutrition, or improvements in nutrient intake, diet composition, food security, and consumption of subsistence foods
HEC5: Infectious disease	Rates of increase or decrease for a range of infectious diseases, such as sexually transmitted infections, respiratory illness, or skin infections; immunization rates; and the presence of infectious disease prevention efforts
HEC6: Water and sanitation	Changes to access, quantity, and quality of water supplies; distance to clean water, water fluoridation, indoor plumbing, water treatment facilities, and existence of community facilities, such as washaterias or community showers
HEC7: Non-communicable and chronic diseases	Increases/decreases in mortality and morbidity rates of cancer, cardiovascular and cerebrovascular diseases, diabetes, respiratory diseases, and mental health disorders; smoking rates, rates of alcohol and drug abuse, physical activity levels, presence of recreation centers, and cancer-screening rates
HEC8: Health services infrastructure and capacity	Increase or decrease in the number of medical evacuations, clinic or hospital visit trends, health expenditures, and medication usage; distance to health facilities, medevac facilities/aircraft, the presence of community health aides, and the frequency of physician visits to the area

Source: DHSS 2015
Note: HEC (health effects category)

Table E.18.2. Health Effect Factors from Relevant Guidance Documents

Alaska HIA Technical Guidance (ADHSS 2015)	HIA for Natural Resource Development in Alaska Collaborative Guidance (NSB 2015)	National Petroleum Reserve in Alaska IAP/EIS Health Effects Analysis (BLM 2012)
HEC1: Social determinants of health	Overall health and well-being Psychological and gender issues Maternal and child health	Acculturative stress Economic impacts on health
HEC2: Accidents and injuries	Accidents and injuries	Safety
HEC3: Exposure to potentially hazardous materials	Contaminant exposure	Environmental exposures
HEC4: Food, nutrition, and subsistence activities	Food, nutrition, and physical activity	Diet and nutrition
HEC5: Infectious disease	Infectious disease	Infectious disease
HEC6: Water and sanitation	Water and sanitation	NA
HEC7: Non-communicable and chronic diseases	Non-communicable/chronic diseases	NA
HEC8: Health services infrastructure and capacity	Health services infrastructure and capacity Occupational/community health interface	Health-care services

Note: HEC (health effects category); HIA (Health Impact Assessment); IAP/EIS (Integrated Activity Plan/Environmental Impact Statement); NA (not applicable)

2.0 REFERENCES

ADHSS. 2015. *Health Impact Assessment Program: Technical Guidance for Health Impact Assessment in Alaska. Version 2.0*. Anchorage, AK: State of Alaska Health Impact Assessment Program.

BLM. 2012. *National Petroleum Reserve-Alaska Final Integrated Activity Plan/Environmental Impact Statement*. Anchorage, AK.

NSB. 2015. *Health Impact Assessment in the North Slope Borough: A Guide for Stakeholders, Decision-Makers and Project Proponents*.

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Appendix E.19
Cumulative Effects Technical Appendix

There is no technical appendix for this resource

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Appendix F
Cultural Resources Findings: Process and Analysis

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List of Acronyms

AHRS	Alaska Heritage Resources Survey
BLM	Bureau of Land Management
BMP	best management practice
DEW	Distant Early Warning
EIS	Environmental Impact Statement
IAP	Integrated Activity Plan
LS	lease stipulation
MDP	Master Development Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPR-A	National Petroleum Reserve in Alaska
NSB	North Slope Borough
OHA	Office of History and Archaeology
Project	Willow Master Development Plan Project
RFFAs	reasonably foreseeable future actions
ROP	required operating procedure
TLUI	Traditional Land Use Inventory

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1.0 CULTURAL RESOURCES FINDINGS: PROCESS AND ANALYSIS

The cultural history of northern Alaska is described in detail in Bureau of Land Management's (BLM's) National Petroleum Reserve in Alaska (NPR-A) Final Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) (BLM 2012). Cultural resources found on the North Slope broadly represent a long prehistory of land use, followed by more recent historic land use by Iñupiat and influences from Euro-Americans beginning in the nineteenth century. Cultural resources on the North Slope can represent a broad variety of types, ranging from distinctly human-made objects and changes to the landscape, to places with less definitive expressions of use by people in the past, albeit with great significance to North Slope communities. Such resources include but are not limited to the following:

- Prehistoric and historic archaeological sites, features, and artifacts, such as those associated with camps and villages, buildings and structures, dwellings (e.g., sod houses, semi-subterranean houses, and tent rings), production and use of objects (e.g., discarded tools and tool-making debris), subsistence activities (e.g., discarded animal bone accumulations, reindeer herding fences, ice cellars, and caches), and transportation (e.g., boat and sled remains).
- Places significant to Iñupiat heritage and traditional land use (e.g., burial places and hunting, fishing, and trapping and camping areas).
- Cultural landscapes and areas important for reasons of cultural identity or religious significance.
- For purposes of the Willow Master Development Plan Project (Project) EIS, paleontological resources are also considered.

A variety of federal, state, and local regulations govern how cultural resources are described and analyzed. Although compliance requirements for these regulations are similar, the types of cultural resources considered, as well as the implementation of cultural resources review, differ. The National Environmental Protection Act (NEPA) requires disclosure and consideration of impacts to the human environment, of which cultural resources are considered a subcategory (40 CFR 1508.14). Section 106 of the National Historic Preservation Act (NHPA) (54 USC 306108) and its implementing regulations (36 CFR 800) require federal agencies to consider the effects of their undertakings on historic properties (prehistoric or historic districts, sites, buildings, structures, or objects listed in or eligible for the National Register of Historic Places). Both NEPA and Section 106 of the NHPA require consultation with agencies and key stakeholders (including tribal and municipal governments and members of the public) and afford a reasonable opportunity for consulting parties to comment on the potential for impacts to cultural resources or to alert the lead agency to the presence of potentially impacted cultural resources. Other regulatory statutes that protect cultural resources include the Antiquities Act (16 USC 431–433), the Historic Sites Act (16 USC 461–467), the Archaeological and Historic Preservation Act (16 USC 469–469c), the American Indian Religious Freedom Act (42 USC 1996), the Archaeological Resources Protection Act (16 USC 470aa–470ll), the Abandoned Shipwreck Act (43 USC 2101–2106), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq.), EO 13007: Indian Sacred Sites, and the Alaska Historic Preservation Act (AS 41.35). The Project would also require a Certificate of Traditional Land Use Inventory (TLUI) Clearance from the North Slope Borough (NSB), certifying that no TLUI sites would be negatively impacted.

The Office of History and Archaeology's (OHA's) Alaska Heritage Resources Survey (OHA 2020), which contains an inventory of all documented archaeological sites in the state of Alaska, is the primary source of information for archaeological resources in the Project area. A subset of the NSB's TLUI within the Project vicinity was acquired from the NSB Department of Iñupiat History, Language and Culture (NSB 2019, 2020); the TLUI is the primary source of information regarding Iñupiat traditional use areas, although BLM pursued additional information through consultation with local and regional tribal and municipal governments and Alaska Native corporations, and the public. Academic literature, agency documents, and cultural resources survey reports from other studies conducted within the Project area provided more robust information about sites documented in the area. Recent cultural resources surveys

conducted in support of the Project (Reanier 2017, 2018, 2019b, 2019c, 2020) provided the most current archaeological site location and condition information for the area.

1.1 Potential Impacts

Direct impacts are those that are caused by, and occur during, the Project (36 CFR 800.5; 40 CFR 1508.8) and are primarily limited to the Project footprint. Ground-disturbing activities (e.g., drilling, gravel mining, construction and use of grounded ice bridge, etc.) pose the greatest threat of direct impacts to cultural resources, especially archaeological sites, by destabilizing, damaging, or destroying subsurface and aboveground cultural resources and contexts. Support activities (including the transport and staging of materials, heavy equipment, and personnel) and manufacture and use of the grounded ice roads and pads could also directly affect surficial and shallowly buried cultural resources through inadvertent ground disturbance, vibration, and compaction.

Indirect impacts are those that occur beyond the Project footprint or after the Project's completion and are reasonably foreseeable. The greatest indirect threats to cultural resources include altering the setting of historic properties and increasing access to otherwise remote and difficult-to-access locations, followed by increased foot or vehicle traffic, resulting in sensitive areas being eroded, vandalized, or looted.

Cumulative impacts include those resulting from past, present, and reasonably foreseeable future actions (RFFAs) or effects relating to the Project and can extend beyond the 2.5-mile indirect effects analysis area. Regarding cultural and paleontological resources, the most significant cumulative effects involve the Project's association with increased future development projects and changes to environmental dynamics resulting from climate change (particularly permafrost degradation and erosion).

1.2 Previously Identified Cultural Resources and Surveys

The Alaska Heritage Resources Survey (AHRS) (OHA 2020) lists 86 cultural sites documented within or overlapping the BLM-recommended 2.5-mile analysis area, none of which fall within the Project footprint. A total of 31 sites in the analysis area have been evaluated for eligibility for inclusion on the National Register of Historic Places (NRHP); 23 were determined eligible and eight were determined ineligible for NRHP inclusion.

Twenty-two (22) of the sites listed in the AHRS (19 cultural and three paleontological) have been destroyed through excavation, removal, or erosion. This includes 12 documented Distant Early Warning (DEW) Line Station sites removed from Point Lonely during environmental remediation activities undertaken by the U.S. Air Force (K. Leeper, Archaeologist [USAF], personal communication to L. O'Quinn [DOWL], March 18, 2019; report pending to OHA).

Of the remaining 64 sites, 12 are paleontological, 10 are prehistoric, 25 are historic or modern Iñupiaq, and 17 are historic or modern Euroamerican. Of the 23 sites in the analysis area evaluated for NRHP eligibility, 17 NRHP-eligible sites remain. There are two documented grave sites (lacking AHRS numbers but falling within other larger site areas at TES-00028 and TES-00045) within the analysis area. The NSB TLUI lists 45 traditional land use sites documented within or overlapping the analysis area (NSB 2020). Ten TLUI sites are co-located with AHRS-documented sites, two of which have been determined eligible for NRHP listing, while three others have been destroyed (Table F.1.1).

Table F.1.1. List of Cultural and Paleontological Sites in the Analysis Area According to the Alaska Heritage Resource Survey and the Traditional Land Use Inventory Data

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
HAR-00002	—	HAR-00002	Prehistoric	Not Eligible	Destroyed
HAR-00005	—	Sod House and Boat on Fish Creek	Historic (Iñupiaq)	No Determination	Intact
HAR-00010	—	Kikkaq	Historic (Iñupiaq)	No Determination	Intact
HAR-00011	TLUIHAR011	Sikulik	Historic, Modern (Iñupiaq)	No Determination	Intact

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
HAR-00014	—	HAR-00014 Reindeer Corral	Historic (Iñupiaq)	Eligible	Partially Destroyed
HAR-00018	—	Ahsogeak Site	Historic (Iñupiaq)	Eligible	Excavated
HAR-00021	—	Niglivik 1	Historic (Iñupiaq)	No Determination	Intact
HAR-00025	TLUIHAR060	Tikigaqmiut/Tikibaq	Historic (Iñupiaq)	No Determination	Unconfirmed
HAR-00026	TLUIHAR091	Atigaru Point/Atibruk	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00027	TLUIHAR038	Kanigluq/Kangiqluk	Historic (Iñupiaq)	Eligible	Threatened
HAR-00029	TLUIHAR089	Ikkalipik	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00045	—	Old Campsite	Historic (Iñupiaq)	No Determination	Partially Destroyed
HAR-00046	—	Leavitt Family Campsite	Historic (Iñupiaq)	No Determination	Partially Destroyed
HAR-00048	—	HAR-00048	Historic (Iñupiaq)	No Determination	Intact
HAR-00049	—	HAR-00049	Historic (Iñupiaq)	No Determination	Intact
HAR-00055	—	Caribou Bone	Modern (Faunal)	No Determination	Destroyed
HAR-00073	—	HAR-00073	Prehistoric (Denbigh, ASTt)	No Determination	Intact
HAR-00080	TLUIHAR030	Niglivik/Niblivik	Historic (Iñupiaq)	No Determination	Intact
HAR-00081	—	Reindeer Corral, Uqalium Kanigana, Uqalik Corral	Historic (Iñupiaq)	No Determination	Intact
HAR-00089	TLUIHAR081	Nappaun (Napaun)	Historic (Iñupiaq)	No Determination	Destroyed
HAR-00090	—	Niglivigauraq Creek 1	Historic (Iñupiaq)	No Determination	Intact
HAR-00091	—	Niglivigauraq Creek 2	Historic (Iñupiaq)	No Determination	Intact
HAR-00098	—	SRBA 2012 C3	Prehistoric	No Determination	Intact
HAR-00100	—	HAR-00100	Prehistoric	No Determination	Intact
HAR-00101	—	HAR-00101	Prehistoric	No Determination	Intact
HAR-00105	—	Drained Lake Blowout	Prehistoric	No Determination	Could not be relocated (2018)
HAR-00106	—	HAR-00106	Prehistoric	No Determination	Intact
HAR-00107	—	HAR-00107	Prehistoric	No Determination	Intact
HAR-00108	—	HAR-00108	Historic, Modern (Iñupiaq)	No Determination	Intact
HAR-00109	—	Sod Feature	Prehistoric	No Determination	Intact
HAR-00110	—	Navy Seismic Camp	Historic (Euroamerican)	No Determination	Intact
HAR-00111	—	Navy Seismic Camp	Historic (Euroamerican)	No Determination	Intact
HAR-00154	—	Katairuaq Grave	Historic (Iñupiaq)	No Determination	Intact
HAR-00156	TLUIHAR082	Nanuq	Historic (Iñupiaq)	No Determination	Intact
HAR-00157	—	Niglivik 2	Historic (Iñupiaq)	No Determination	Intact
HAR-00158	—	Putu	Historic (Iñupiaq)	No Determination	Disturbed
HAR-00167	—	Kayuqtusilik	Historic (Iñupiaq)	No Determination	Intact
HAR-00168	—	Aqsiataaq Inaat	Historic (Iñupiaq)	No Determination	Intact
HAR-00172	—	HAR-00172	Prehistoric	No Determination	Intact
HAR-00173	—	Colville #1 Peat Road	Historic (Euroamerican)	Eligible	Intact
TES-00028	TLUITES222	Kolovik/Qalluvik	Historic (Iñupiaq)	Eligible	Threatened
TES-00032	—	Building 1, Dew Operations Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00033	—	Building 2, Maintenance Shop Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
TES-00034	—	Building 12, Supply and Equipment Warehouse Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00035	—	Building 13, Pump Station Lonely LRRS Dew Line Facilities	Historic (Euroamerican)	Eligible	Destroyed
TES-00036	—	Building 15, Pump Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00037	—	Building 17, Pump Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00038	—	Building 18, Aircraft Shelter Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00039	—	Building 19, Air Freight and Passenger Terminal Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00040	—	Building 20, Warehouse Supply and Equipment Building Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00041	—	Building 100, Radome Tower Building Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00042	—	Building 101, Electric Power Station Lonely LRRS Dew Line Facilities	Modern (Euroamerican)	Not Eligible	Destroyed
TES-00043	—	Gravel Structures Lonely SRRS Road System	Historic (Euroamerican)	Eligible	Partially Destroyed
TES-00044	—	Gravel Structures Lonely SRRS Airfield	Historic (Euroamerican)	Eligible	Intact
TES-00045	—	Gravel Structures Lonely SRRS Gravel Pad System	Historic (Euroamerican)	Eligible	Partially Destroyed
TES-00048	—	POW-1	Historic (Euroamerican)	Eligible	Destroyed
XBP-00002	—	Oliktok Point	Historic (Euroamerican)	No Determination	Intact
XBP-00033	—	Kuparuk Pingo	Prehistoric (Northern Archaic)	No Determination	Excavated
XBP-00036	TLUIXBP016	Ugrugnavik River	Historic (Iñupiaq)	No Determination	Unconfirmed/ Destroyed
XBP-00037	—	Thetis Pingo	Prehistoric, Historic (Iñupiaq, Euroamerican)	No Determination	Disturbed
XBP-00039	—	Pow-2	Historic (Euroamerican)	Eligible	Intact
XBP-00050	—	Building 1, Civilian Camp Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00051	—	Building 2, Vehicle Maintenance Shop Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00052	—	Building 3, Aircraft Shelter Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
XBP-00053	—	Building 8, Supply and Equipment Warehouse Oliktok Dew Line Facilities	Historic, Modern (Euroamerican)	Eligible	Intact
XBP-00054	—	Building 17, Fuel Pump Station Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00055	—	Building 18, Weather Building Oliktok Dew Line Facilities	Historic (Euroamerican)	Eligible	Intact
XBP-00057	—	Gravel Structures Oliktok LRRS Road System	Historic (Euroamerican)	Eligible	Intact
XBP-00058	—	Gravel Structures Oliktok LRRS Airfield	Historic (Euroamerican)	Eligible	Intact
XBP-00059	—	Gravel Structures Oliktok LRRS Gravel Pad System	Historic (Euroamerican)	Eligible	Intact
XBP-00119	—	Ugnuravik Pingo	Historic (Iñupiaq)	No Determination	Intact
—	TLUIHAR006	Inibruat	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR007	Narvabauraq	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR012	Sikulik Lake	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR015	Savikpaligauram Leitublia	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR017	Ayuvieam Ixuvia	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR023	Ayuviea	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR027	Qitiq	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR031	Niblivigauram Narvafi	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR032	Itivliqpak	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR033	Niblivigauram Narvafa	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR035	Tifmiaqpalik	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR059	Apkugaruk	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR065	Sabviavik	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR066	Anagguvik	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR068	Tiglak	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR069	Putu	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR079	Kayuqtusilik	Historic (Iñupiaq)	N/A	Intact
—	TLUIHAR103	Sigiaruk	Historic (Iñupiaq)	N/A	Intact
—	TLUITES104	Abnaqsraq	Historic (Iñupiaq)	N/A	Intact
—	TLUITES216	Ayagutaq	Historic (Iñupiaq)	N/A	Intact
—	TLUITES217	Nalluabruum Paafa	Historic (Iñupiaq)	N/A	Intact
—	TLUITES218	Sisamalik	Historic (Iñupiaq)	N/A	Intact
—	TLUITES220	Tasibaabruk	Historic (Iñupiaq)	N/A	Intact
—	TLUITES221	Afupqan Ieitublia	Historic (Iñupiaq)	N/A	Intact
—	TLUITES225	Natibnauraq	Historic (Iñupiaq)	N/A	Intact
—	TLUITES226	Kifiefuq	Historic (Iñupiaq)	N/A	Intact
—	TLUITES227	Qiruktabiaq	Historic (Iñupiaq)	N/A	Intact
—	TLUITES229	Igluqabvialuk	Historic (Iñupiaq)	N/A	Intact
—	TLUITES230	Tigutaam Paafa	Historic (Iñupiaq)	N/A	Intact
—	TLUITES233	Kuvrabliq	Historic (Iñupiaq)	N/A	Intact
—	TLUITES238	Tigutaam Kuufa	Historic (Iñupiaq)	N/A	Intact
—	TLUITES244	Tigutaaq	Historic (Iñupiaq)	N/A	Intact
—	TLUIXBP013	Sannifaruaq	Historic (Iñupiaq)	N/A	Intact
—	TLUIXBP014	Uuliktuq	Historic (Iñupiaq)	No Determination	Partially Destroyed
—	TLUIXBP015	Ufurabvik	Historic (Iñupiaq)	N/A	Intact
HAR-00032	—	Pa, D306t	Paleontological	N/A	Intact
HAR-00033	—	Pa, 34571 Observation Point (Blm Ak-83-V)	Paleontological	N/A	Intact

AHRS No.	TLUI No.	Site Name/Description	Site Type	Determination of NRHP Eligibility	Condition
HAR-00034	—	Pa, Ocean Point	Paleontological	N/A	Intact
HAR-00035	—	Pa, Ocean Point	Paleontological	N/A	Intact
HAR-00036	—	Pa, D306, Loc. 1	Paleontological	N/A	Intact
HAR-00038	—	PA, Carter Et Al. 1978 Site A	Paleontological	N/A	Intact
HAR-00040	—	Pa, 7	Paleontological	N/A	Intact
HAR-00057	—	Pa, Mammoth Femur Sticking Vertically from Ground	Paleontological	N/A	Excavated
HAR-00060	—	Pa, Old Bone Beach	Paleontological	N/A	Intact
HAR-00061	—	Pa, Liscomb Bed	Paleontological	N/A	Intact
HAR-00067	—	HAR-00067	Paleontological	N/A	Excavated
HAR-00075	—	Metatarsal Bar	Paleontological	N/A	Disturbed
HAR-00170	—	Mammoth Bone	Paleontological	N/A	Destroyed
TES-00029	—	Pa, 2	Paleontological	N/A	Intact
TES-00030	—	Pa, 6	Paleontological	N/A	Intact

Note: — (no data); AHRS (Alaska Heritage Resources Survey); NRHP (National Registry of Historic Places); TLUI (Traditional Land Use Inventory).

The AHRS sites nearest to any Project components occur near Module Delivery Options 2 and 3. Module Delivery Option 2 would use the existing gravel infrastructure at Point Lonely to stage modules prior to transport via ice road to the Project area. The gravel infrastructure at Point Lonely consists of three intact, or largely intact, sites (TES-00043, TES-00044, and TES-00045) all of which were determined eligible for NRHP listing prior to remediation activities at the site. Impacts to these gravel pads from staging and transport of the Project modules is unlikely as these activities would occur in winter and primarily over land-based ice road. The gravel pads will not be modified and their proposed use (for staging and transport purposes) is consistent with their historical function.

The nearest site to Module Delivery Option 3 gravel road components is the Kuparuk Pingo site (XBP-00033), which was excavated by Lobdell (Lobdell 1986) and revisited by Reanier (Reanier 2013). Any road improvements undertaken for module transport will not impact this site as it is separated from the road by a lake. The nearest AHRS site to the Option 3 ice road route is HAR-00073, a Denbigh Flint Complex site roughly 750 feet south of the proposed ice road route (Reanier 2020). The proposed location for the Option 3 ice bridge across the Colville River is roughly 0.5 miles downriver (south and east) of the last outcrops of the Prince Creek Formation, a well-documented site that still produces paleontological materials (Druckenmiller 2009, 2010; P. Druckenmiller, Paleontologist (UAF), personal communication to C. Kennedy (DOWL), January 31, 2020). All other known sites are distant from proposed Project infrastructure.

The Proponent conducted surveys to identify cultural resources in the Project area in 2018 and 2019 and will continue surveys in summer 2020 (Reanier 2018, 2019b, 2019c, 2020). To date, the Proponent has surveyed 100% of proposed terrestrial gravel infrastructure and approximately 90% of proposed ice road alignments. In addition, the cultural resources analysis area has been examined repeatedly for cultural resources due to nearby oil and gas development projects and academic studies since 1980 (Hemmeter, Teese et al. 2019; Lobdell 1981, 1982, 1985, 1988, 1991, 1993, 1996, 1998a, 1998b, 1999; Lobdell and Lobdell 1999; Mobley & Associates 2016; Reanier 2003, 2004, 2008, 2013, 2014, 2019a; SRB&A 2018).[1] Collectively, the Proponent's and others' surveys have covered 100% of the direct Project footprint, including proposed ice road alignments. Figure F.1.1 depicts aerial and/or ground surveys conducted within the analysis area.

1.3 Findings

The Project would not likely result in direct or indirect impacts to historic properties or paleontological resources. BLM permit requirements ensure that a cultural resources survey would be undertaken, and

[1] This list is not exhaustive.

cultural resources avoided; NSB requires TLUI clearance before issuance of permits; and the Proponent's voluntary avoidance measures and operating procedures (provided in Appendix I.1, *Avoidance, Minimization, and Mitigation*) are also intended to protect cultural resources. The coverage and results of Project surveys and previous surveys indicate that previously undocumented cultural resources are unlikely to exist in the analysis area (Figure F.1.1).

Table F.1.2 summarizes existing and proposed NPR-A IAP lease stipulations (LSs) and best management practices (BMPs) that would apply to Project actions on BLM-managed lands and are intended to mitigate impacts to cultural resources from development activity (BLM 2013). The BMPs would reduce impacts to cultural resources associated with the construction, drilling, and operation of oil and gas facilities. BLM is currently revising the NPR-A IAP (BLM 2013), including potential changes to required BMPs (described as Required Operating Procedures [ROPs] in the 2020 IAP/EIS). Updated ROPs adopted in the 2020 NPR-A IAP will replace existing (BLM 2013) BMPs. The Willow Master Development Plan (MDP) Record of Decision will detail which of the measures described below will be implemented for the Project. Table F.1.2 also summarizes new ROPs or proposed substantial changes to existing NPR-A IAP BMPs that would help mitigate impacts to cultural resources. Although many of the LSs (where they are applied as BMPs) and BMPs have proposed minor language revisions, Table F.1.2 only includes changes that would be apparent in the paraphrased table text. Full text of the changes to BMPs is provided in BLM (2020).

Table F.1.2. Summary of Applicable Lease Stipulations and Best Management Practices Intended to Mitigate Impacts to Cultural Resources

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP C-2	Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.	Ground operations shall be allowed only when frost and snow cover are at sufficient depths to protect tundra. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation.	– Ground operations would only be allowed when frost and snow cover are at sufficient depth, strength, density, and structure to protect the tundra. Soils must be frozen to at least 23 degrees F at least 12 inches below the lowest surface height (e.g., inter-tussock space). Tundra travel would be allowed when there is at least 3 to 6 inches of snow (depending on the alternative). For alternatives B, C, and D: Snow depth and snow density must amount to no less than a snow water equivalent of 3 inches over the highest vegetated surface (e.g., top of tussock) in the National Petroleum Reserve in Alaska. – Snow survey and soil freeze-down data collected for ice road or snow trail planning and monitoring shall be submitted to the BLM. – Clearing or smoothing drifted snow is allowed to the extent that the tundra mat is not disturbed. Only smooth pipe snow drags would be allowed for smoothing drifted snow. – For alternatives B, C, and D: avoid using the same routes for multiple trips, unless necessitated by serious safety or environmental concerns and approved by the BLM. This provision does not apply to hardened snow trails or ice roads. – Ice roads would be designed and located to avoid the most sensitive and easily damaged tundra types, as much as practicable. For alternatives B, C, and D: ice roads may not use the same route each year; ice roads would be offset to avoid portions of an ice road route from the previous 2 years. – See ROP E-13 for requirements to protect cultural and paleontological resources

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP E-13	Protect cultural and paleontological resources.	Lessees shall conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee or their designated representative shall notify the authorized officer and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer.	Added Text: Primary investigators overseeing cultural surveys must meet the Secretary of the Interior's professional qualification standards for qualified professional archaeologists (36 CFR 61, Appendix A). Permittees shall avoid known cultural and paleontological sites by a minimum of 500 feet from the site boundary.
BMP I-1	Minimize cultural and resource conflicts.	All personnel involved in oil and gas and related activities shall be provided information concerning applicable stipulations, BMPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region and attend an orientation once a year.	Changes do not affect text as described.
LS/ BMP K-1[a]	(Rivers) Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabins and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values.	Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines are prohibited in stream beds and adjacent to rivers listed. Rivers in the Project area that are listed include Colville River (2-mile setback), Fish (Uvlutuuq) Creek (3-mile setback), Judy (Iqalliqpik) Creek (0.5-mile setback), and Ublutuoch (Tiŋmiaqsiuġvik) River (0.5-mile setback).	No surface occupancy or new infrastructure, except essential road and pipeline crossings in the following setbacks: Colville River (2- to 7-mile setback), Judy (Iqalliqpik) Creek (0.5- to 1-mile setback), Ublutuoch (Tiŋmiaqsiuġvik) River (0.5- to 1-mile setback). Gravel mines may be located within the active floodplain, consistent with BMP E-8.

Source: BLM 2013, 2020
Note: BLM (Bureau of Land Management); BMP (best management practice); IAP (Integrated Activity Plan); LS (lease stipulation); ROP (required operating procedure).
[a] Revisions to BMP K-1 LSs and BMPs are provided as a range of values reflecting different action alternatives in the IAP BLM 2020.

All action alternatives would require deviations from existing BMP K-1 because they would include road and pipeline crossings of one or more of the waterbodies protected in the BMP. These deviations would not result in adverse impacts to cultural resources.

Areas of traditional subsistence land use are a critical cultural element in the Project area and are addressed in Section 3.16, *Subsistence and Sociocultural Systems*, of the EIS. TLUI clearance is required by NSB to ensure avoidance of sensitive Alaska Native cultural sites before issuing a Development Permit or Administrative Approval, and the Proponent must seek TLUI clearance before receiving a permit from NSB. Potentially undocumented places that are significant to North Slope heritage but lack definitive expressions of land use are best identified and assessed through consultation with local and regional tribal and municipal governments and Alaska Native corporations, as well as other community members. BLM's efforts thus far to consult with these entities within Nuiqsut and the NSB under NEPA and Section 106 have not resulted in expressed concerns for impacts to specific cultural resources within the Project area.

No cultural resources have been identified within the Project footprint. The Proponent will conduct additional surveys to identify cultural resources in the analysis area for Option 3 in summer 2020 (Reanier 2020). The Proponent would opt to route all Project components at least 500 feet from all recorded cultural sites and would avoid the Prince Creek Formation when constructing the ice road crossing of the

Colville River near Ocean Point. To ensure appropriate treatment of inadvertent discoveries, the Proponent would maintain a Fossil and Artifact Finds Standard Operating Procedure.

Cultural resources and paleontological resources outside the Project footprint would also be unlikely to be impacted by the proposed undertaking. The six cultural sites located within 2.5 miles of new Willow permanent infrastructure (HAR-00005, HAR-00048, HAR-00049, HAR-00105, HAR-00109, and HAR-00110) are all located more than mile from any new permanent infrastructure. While it is possible that the proposed permanent Project infrastructure may result in some perceptible visual, audible, or olfactory change within any of these six sites' settings for the life of the Project, such changes are expected to be minimal and negligible. Considering the following

1. The distances separating these sites from proposed permanent infrastructure
2. The narrow fields of view in which infrastructure could be visible from each site
3. The nature of the site themselves, which are limited to collapsed structures and debris scatters

Any visual, audible, or olfactory changes would be minimal and would unlikely affect the character of how and why these properties are situated in relation to their surrounding environments. Therefore, it is unlikely that the Project would substantially alter these settings in ways that would alter their NRHP eligibility or result in adverse effects.

Access to Project infrastructure would be controlled and would not be accessible to members of the public, and ConocoPhillips Alaska, Inc. staff would undergo cultural awareness training before deployment; this training would inform personnel on how to identify archaeological materials, thereby reducing the risk of inadvertent disturbance of culturally significant sites. Although increased access to cultural resources has been documented to correlate strongly with increased instances of vandalism and looting of cultural resources sites (Hedquist, Ellison et al. 2014; Spangler, Arnold et al. 2006), these impacts would be improbable due to conditions specific to the Project area and timeline. Ice roads and pads would only be used during winter construction seasons. Therefore, unsurveyed portions of the area of potential effect situated within 2.5 miles of the proposed ice road routes (as shown in Figure F.1.1) would be unlikely to be affected due the timing of ice road construction and use. Access to cultural resources areas in the summer months, while possible, is complicated by the surrounding terrain. Off-road travel in the Project area during summer months is suboptimal by foot or vehicle, given that the tundra during this season is uneven, frequently inundated, and spongy.

1.3.1 Cumulative Effects

Section 3.19, *Cumulative Effects*, of the Final EIS addresses the potential for Project impacts to accumulate with those associated with past, present, and RFFAs, and what those effects might be. While increasing oil and gas and transportation projects relating to the Project can potentially adversely affect historic properties, the majority of lands or coastal regions on or along the North Slope are managed or owned by either Federal agencies or the State of Alaska. Future activities connected to the Project within Federally managed areas or on State of Alaska lands would be subject to Section 106 of the NHPA or the Alaska Historic Preservation Act, respectively. Similarly, any future actions connected to the Project that occur outside state of Federal lands, but with a federal nexus (including rights-of-way) would be subject to Section 106 of the NHPA. Therefore, RFFAs resulting from the Project are not expected to result in cumulative effects to historic properties, cultural resources, or paleontological sites.

Climate change associated with the cumulative effects of past, present, and future oil and gas development could adversely affect cultural and paleontological resources. However, the potential climate change impacts are not expected to be universal or predictable across the analysis area as a myriad of factors influence the degree to which climate change can affect a specific location, region, habitat, or ecosystem. Some locales may be substantially affected, while others may not be affected at all (BLM 2012). According to the Willow MDP Final EIS evaluation of cumulative impacts to soils and permafrost (Section 3.19.6, *Cumulative Impacts to Soils, Permafrost, and Gravel Resources*), the Project would have effects on soils and permafrost like those of past and present actions and would contribute to the

cumulative effects of past, present, and RFFAs. However, given the scope of the Project considered in context of past, present, and RFFAs, the Project would not change the cumulative impacts on soils or permafrost in the analysis area. Therefore, while the Project is expected to contribute to cumulative effects to soils and permafrost overall, it is not currently possible to predict where impacts from the Project would occur, to what extent they would occur, or if those effects would adversely affect historic properties.

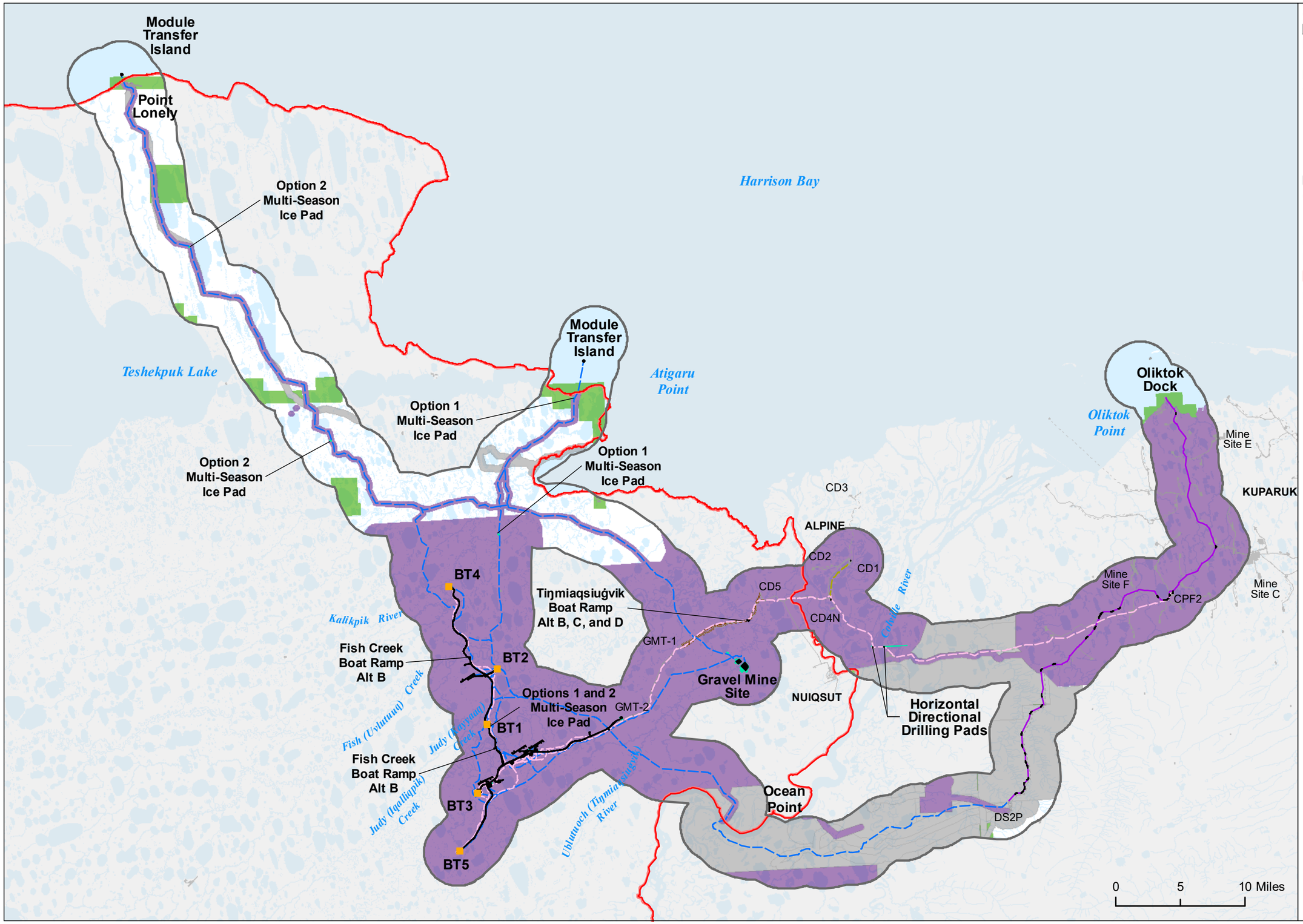

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Figure F.1.1

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Willow Master Development Plan

Appendix G
Alaska National Interest Lands Conservation Act Section 810 Analysis

August 2020

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List of Acronyms and Abbreviations

ANILCA	Alaska National Interest Lands Conservation Act
ATV	all-terrain vehicle
BLM	Bureau of Land Management
BMP	best management practices
BT1	Bear Tooth drill site 1
BT2	Bear Tooth drill site 2
BT3	Bear Tooth drill site 3
BT4	Bear Tooth drill site 4
BT5	Bear Tooth drill site 5
BTU	Bear Tooth Unit
CAH	Central Arctic Caribou Herd
CPAI	ConocoPhillips Alaska, Inc.
CRD	Colville River Delta
DS2P	Kuparuk drill site 2P
EIS	Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
GMT	Greater Mooses Tooth
GMT-1	Greater Mooses Tooth 1
GMT-2	Greater Mooses Tooth 2
IAP/EIS	Integrated Activity Plan/Environmental Impact Statement
Kuukpik	Kuukpik Corporation
MTI	module transfer island
NEPA	National Environmental Policy Act
NPR-A	National Petroleum Reserve in Alaska
NPRPA	Naval Petroleum Reserves Production Act
Project	Willow MDP Project
ROD	Record of Decision
ROP	required operating procedures
SDEIS	Supplement to the Draft EIS
TCH	Teshekpuk Caribou Herd
Willow MDP	Willow Master Development Plan
WOC	Willow Operations Center
WPF	Willow Processing Facility

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ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT SECTION 810 ANALYSIS OF SUBSISTENCE IMPACTS

This analysis of subsistence impacts is for the Willow Master Development Plan (Willow MDP) Final Environmental Impact Statement (EIS). ConocoPhillips Alaska, Inc. (CPAI) is seeking approval to develop and produce oil from leases in the Bear Tooth Unit (BTU) of the National Petroleum Reserve in Alaska (NPR-A) via five drill sites and pipelines that would connect to the Greater Mooses Tooth 2 (GMT-2) development (currently under construction) and existing Alpine development facilities in the Colville River Delta (CRD). The Project would include its own processing facility, an operations center, ice and gravel roads, and either one or two airstrips depending on the selected alternative. The Project would be located on the North Slope of Alaska in the northeast section of the NPR-A, west of the Colville River, CRD, and the community of Nuiqsut; however, module delivery facilities and related ice roads would also be located to the east and south of Nuiqsut, including a crossing of the Colville River.

The proposed Project drill sites and the majority of operational infrastructure would be located on federal lands in the NPR-A managed by the Bureau of Land Management (BLM). Some supporting infrastructure (e.g., portions of the gravel access road, temporary ice roads, and pipelines) would be located on lands owned by the Kuukpik Corporation (Kuukpik) and the State of Alaska. Conveyed and selected Native (Kuukpik) lands would include portions of Project pipelines, roads, and Colville River pipeline crossing pads. State of Alaska lands would include portions of Project pipelines. Two of the three Willow MDP EIS alternatives analyzed include a gravel road connection from the GMT-2 drill site to the Project area. All of the action alternatives include a pipeline that would connect Project drill sites to existing pipeline infrastructure to the east.

The Willow MDP Final EIS considers three alternatives and three module delivery options, in addition to a No Action Alternative (Alternative A). While the Willow MDP Final EIS analysis provides an evaluation for the three Willow MDP EIS action alternatives and three module delivery options separately, any final subsistence determinations should consider the implementation of alternatives in combination with each of the module delivery options because one of the three options would occur under any action alternative. The three Willow MDP action alternatives include the Proponent's Project (Alternative B), which includes a gravel access road connecting the Project to the existing GMT-2 and Alpine developments; Disconnected Infield Roads (Alternative C), which reduces the gravel footprint but maintains a year-round gravel road connection to the existing GMT-2 and Alpine developments; and Disconnected Access (Alternative D), which does not include a year-round gravel access road connection to the existing GMT-2 and Alpine developments. The three module delivery option alternatives include the Atigaru Point Module Transfer Island (MTI) (Option 1); the Point Lonely Module Transfer Island (Option 2); and the Colville River Crossing (Option 3). Each of these options would construct ice road connections to the Project area, and two of the options (Options 1 and 2) would construct a man-made island to support gravel hauling and module transport. Either MTI would be located in State of Alaska waters, while other associated infrastructure (e.g., ice roads, ice pads) would be located on federal lands in the NPR-A.

Chapter 3.0, *Affected Environment and Environmental Consequences*, of the Willow MDP Final EIS describes the current environmental status of the Project area and potential effects of the alternative development scenarios to the physical, biological, and social environment. In particular, Section 3.16, *Subsistence and Sociocultural Systems*, addresses the affected environment and environmental consequences for subsistence, traditional use, and sociocultural systems. Other relevant sections include Section 3.10, *Fish*; Section 3.11, *Birds*; Section 3.12, *Terrestrial Mammals*; Section 3.13, *Marine Mammals*; and Section 3.18, *Public Health*. This analysis uses that information to evaluate potential impacts to subsistence uses and needs pursuant to Section 810(a) of the Alaska National Interest Lands Conservation Act (ANILCA). This analysis is organized to inform BLM's findings of significance based on the factors listed below (Section A). While the Willow MDP Final EIS provides both a description of the affected environment and an analysis of the environmental consequences of the Project, this document

provides an evaluation of the potential impacts of the Project on subsistence uses and needs, followed by BLM's findings of significance for each Project alternative and the cumulative case.

A. SUBSISTENCE EVALUATION FACTORS

Section 810(a) of ANILCA, 16 USC 3120(a), requires that an evaluation of subsistence uses and needs must be completed for any federal determination to "withdraw, reserve, lease, or otherwise permit the use, occupancy or disposition of public lands." All of the Project's proposed drill sites, Willow Processing Facility (WPF), Willow Operations Center (WOC), gravel roads, air strip(s), and sections of associated pipelines and ice roads would be located on BLM-managed public lands under all action alternatives. Thus, an evaluation of potential impacts to subsistence under ANILCA Section 810(a) must be completed for the Willow MDP EIS. All impacts to subsistence uses and needs are evaluated herein regardless of land status.

ANILCA requires that this evaluation include findings on three specific issues:

1. The effect of use, occupancy, or disposition on subsistence uses and needs. The availability of other lands for the purposes sought to be achieved.
2. Other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 USC Section 3120(a)).

Following BLM Alaska guidance (BLM IM No. AK-2011-008), three factors are considered when determining if a significant restriction of subsistence uses and needs may result from the proposed action and alternatives, or in the cumulative case:

1. Reductions in the abundance of subsistence resources caused by a decline in the population or amount of harvestable resources.
2. Reductions in the availability of resources used for subsistence purposes caused by alteration of their normal locations, migration, and distribution patterns.
3. Limitations on access to subsistence resources, including from increased competition for the resources.

Willow MDP Final EIS Section 3.16.1, *Affected Environment*, and Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*, provide information on areas and resources important for subsistence use, and the degree of dependence of Nuiqsut and Utqiaġvik (Barrow) on different subsistence populations. The Willow MDP Final EIS Section 3.16.2, *Environmental Consequences*, provides data on subsistence resource availability and limitations that each action alternative would place on access and is used to determine whether the action alternatives may cause a significant restriction to subsistence uses.

A finding that the proposed action may significantly restrict subsistence uses imposes requirements to notify the State of Alaska and appropriate regional and local subsistence committees, hold hearings in affected communities, and make the following determinations before BLM can authorize the use of public lands:

- Such a significant restriction of subsistence uses is necessary and consistent with sound management principles for the use of the public lands.
- The proposed activity would involve the minimal amount of public lands necessary to accomplish the purposes of the use, occupancy, or other disposition.
- Reasonable steps would be taken to minimize adverse effects upon subsistence uses and resources resulting from such actions (16 USC 3120(a)).

A proposed action or alternative would be considered to significantly restrict subsistence uses if, after consideration of stipulations or protection measures (e.g., lease stipulations and best management practices [BMPs], or required operating procedures [ROPs]) included as a part of each alternative, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources. Substantial reductions in the opportunity to continue subsistence uses generally are caused by large reductions in resource abundance, a major redistribution of resources, extensive

interference with access, or major increases in the use of those resources by non-subsistence users (BLM IM AK-2011-008).

When analyzing the effects of Project alternatives, particular attention is paid to Nuiqsut, the community that has the potential to be most directly impacted by the Project. Nuiqsut is located on the Niġliq Channel of the Colville River, and the Project area lies within a substantial portion of the community's subsistence use area (Willow MDP Final EIS Section 3.16, *Subsistence and Sociocultural Systems*, Figure 3.16.1). Additionally, the analysis considers potential effects to Utqiaġvik because the Project would be in the eastern portion of the community's subsistence use area and some components would be close to Teshekpuk Lake, a key traditional use area for the community. The cumulative analysis expands the evaluation of potential impacts to consider areas beyond the Project area in which past activities have impacted North Slope subsistence uses, in which current activities are impacting North Slope subsistence uses, or in which future activities could occur that could impact Nuiqsut, Utqiaġvik, or other North Slope communities' subsistence uses or the subsistence resources that rely upon the habitats affected.

In addition to ANILCA, Environmental Justice, as defined in Executive Order 12898, also calls for an analysis of the effects of federal actions on minority populations with regard to subsistence. Specifically, Environmental Justice is:

> *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.*

Section 4-4 of the Executive Order on Environmental Justice, regarding the Subsistence Consumption of Fish and Wildlife, requires federal agencies to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish or wildlife for subsistence, and to communicate to the public any risks associated with those consumption patterns. To this end, the action alternatives subsistence analyses, located in Section 3.16 of the Willow MDP Final EIS, have been reviewed and found to comply with Executive Order 12898.

B. ANILCA SECTION 810(A) EVALUATIONS AND FINDINGS FOR ALL ALTERNATIVES AND THE CUMULATIVE CASE

Evaluations and findings for Alternatives A, B, C, and D, module delivery Options 1, 2, and 3, and the cumulative case are presented individually in the following sections. BMPs established by the 2012 NPR-A Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) Record of Decision (ROD) (BLM 2013) would apply to all Project alternatives. CPAI's leases in the BTU are subject to lease stipulations established in the 2008 Northeast NPR-A Supplemental IAP ROD (BLM 2008). The mitigating effects of these BMPs and lease stipulations are accounted for in the following evaluations and findings.

1. Evaluation and Finding for Alternative A (No Action)

The No Action Alternative of the Willow MDP EIS precludes the currently proposed development in the BTU, and no oil from the BTU field would be produced. Under this alternative, no new roads, airstrips, pipelines, or other oil and gas facilities would be constructed pursuant to CPAI's proposal for development in the BTU.

Activities that are currently allowed pursuant to the 2013 NPR-A IAP/EIS ROD would continue. These activities include seismic exploration, exploratory drilling of test wells, and the construction of ice roads and pads to support these operations.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

No additional impacts to subsistence uses and needs would be expected under the No Action Alternative. Impacts in the Project area would be expected from those actions associated with scientific research during the summer and oil and gas exploration during the winter. Numerous studies are conducted on a year-round basis on the North Slope. Aerial surveys are conducted by fixed-wing aircraft or helicopter, and ground surveys are conducted on foot, snow machine, or by all-terrain vehicle (ATV); these activities have the potential to disturb wildlife. However, the effects of these activities on species used by subsistence users are expected to be local and short-term and would have no regional population effects.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation for Willow MDP EIS Alternative A (No Action) regarding the availability of other lands is not applicable because Alternative A does not propose the disposition or use of public lands.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternative A (No Action) would not eliminate the use of public lands needed for subsistence purposes. However, Alternative A does not meet the purpose of the proposed action to produce oil discovered on CPAI's BTU leases. The Willow MDP Final EIS Appendix D.1, *Alternatives Development*, Section 3.1.3 (*Alternative Components Considered but Eliminated from Further Analysis*) discusses other alternatives that were considered but eliminated from detailed analysis due to economic or technological feasibility or practicability, or because they did not meet the purpose of the proposed action. Alternative A is included in the analysis for baseline comparison, but BLM does not have the authority to select this alternative because CPAI's leases are valid and provide the right to develop the oil and gas resources therein.

d. Findings

The effects of the No Action Alternative fall below the level of possibly significantly restricting subsistence uses and needs. The impacts to subsistence resources and access discussed above would be minimal. This finding applies to the entire Project study area.

2. Evaluation and Finding for Alternative B (Proponent's Project)

Development of oil reserves in the BTU would occur under Alternative B, the Proponent's Project. Infrastructure would include five drill sites (BT1, BT2 , BT3, BT4, and BT5), WPF, WOC, an all-season gravel road connection extending from the GMT-2 drill site southwest to the WPF, an airstrip, infield and export pipelines, gravel roads (including eight turnouts with subsistence/tundra access ramps and seven associated bridges) connecting the five drill sites to the WPF, and a water source access road near BT5. Gravel roads would cross both the Judy (Iqalliqpik and Kayyaaq) and Fish (Uvlutuuq) creeks. The Proponent would also construct up to three boat ramps for subsistence uses. Once of the boat ramps, common to all action alternatives, would provide access to the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and Greater Mooses Tooth 1 (GMT-1). Up to two additional boat ramps would be constructed along Judy (Iqalliqpik) Creek and/or Fish (Uvlutuuq) Creek pending further community input. All three boat ramps would be accessed via short roads connected to Project roads near Project bridges. During construction, the Project would also develop the Tiŋmiaqsiuġvik gravel mine site (with up to two distinct mine pits), a module delivery option (see Sections B.5, *Evaluation and Findings for Module Delivery Option 1: Atigaru Point Module Transfer Island;* B.6, *Evaluation and Findings for Module Delivery Option 2: Point Lonely Module Transfer Island; and Option 3: Colville River Crossing*), and associated ice roads for gravel haul and/or module transport. All action alternatives would use Oliktok Dock for the delivery of Project materials.

In the Willow MDP Final EIS, BLM analyzed potential direct impacts on subsistence based on a 2.5-mile buffer of permanent and temporary (e.g., ice roads) infrastructure associated with Alternatives B, C, and D, in addition to the gravel mine site, ice roads, and Oliktok Dock (Figure 1). Because the 2.5-mile buffer of the three action alternatives is nearly identical, it was not necessary to provide a separate analysis area for each action alternative. Thus, while the footprint of development infrastructure and activity is similar

under all action alternatives, differences in infrastructure design, infrastructure placement, and operational details determine how and to what level subsistence uses would be affected. These differences are discussed qualitatively. The alternatives analysis area includes both permanent infrastructure and temporary infrastructure (e.g., ice roads, ice pads) that would only be present during the construction phase. The difference in impacts between the construction and operations phases are discussed qualitatively. In addition, the alternatives analysis area does not include upgrades to infrastructure or new infrastructure that would occur within the footprint of existing development areas (e.g., new pipelines that would colocate with existing pipelines and roads east of GMT-2), nor does it include all areas where development-related activity, such as air traffic, would occur. These indirect effects are discussed where applicable. While each action alternative would also include a module delivery option and associated ice roads, because there is more than one module delivery option, the three options and associated ice infrastructure are analyzed separately using a separate 2.5-mile buffer (Sections B.5, B.6, and B.7).

The alternatives analysis area allows for more detailed analysis of the area where subsistence users are most likely to experience direct impacts from the Project. Additional direct and indirect impacts that would occur outside the alternatives analysis area are also addressed. In addition to the alternatives analysis area, a direct effects analysis area, which is defined as a 2.5-mile buffer around all action alternatives and module delivery options, is used in the Willow MDP FEIS Subsistence Appendix (Appendix E.16) to characterize the nature of subsistence uses, including timing and transportation methods, within the area of potential direct effects.

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Atigaru Point
Harrison Bay
Oliktok Dock
CD3
CD2
CD1
CD5
CD4N
BT4
BT2
BT1
BT3
BT5
Kalikpik River
Fish (Uvlutuuq) Creek
Lake M0235
Lake L9911
Lake M0015
Lake R0064
Judy (Iqalliqpik) Creek
GMT-1
GMT-2
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
Colville River
Ocean Point
DS2P
0
5
10 Miles

Willow Proposed Development Features
- Alternative Analysis Area
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

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Figure 1

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a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The Willow MDP alternatives analysis area (Figure 1) lies within areas heavily used by Nuiqsut residents for subsistence (Figure 2), particularly for harvesting of caribou and furbearers (wolf and wolverine) with some goose hunting and limited moose and eider hunting also occurring within the alternatives analysis area. The Oliktok Dock portion of the alternatives analysis area overlaps with Nuiqsut offshore seal and eider use areas in addition to coastal caribou hunting areas. The alternatives analysis area lies within the eastern periphery of Utqiaġvik subsistence use areas for wolf, wolverine, and caribou (Figure 3). During interviews with Nuiqsut active harvesters for the 1995 through 2006 time period, 91% of harvesters reported using the alternatives analysis area, with wolf, wolverine, and caribou being the primary targeted resources (Table 3.16.5 in the Willow MDP Final EIS Section 3.16.2.3, *Alternative B: Proponent's Project*). Based on annual data for the Nuiqsut Caribou Subsistence Monitoring Project for the 2008 through 2016 time period, use of the alternatives analysis area for caribou hunting on an annual basis appears somewhat lower (between 35% and 72% during individual study years, Table 3.16.6 in the Willow MDP Final EIS Section 3.16.2.3). The percent of total caribou harvests occurring within the alternatives analysis area throughout 9 years of the Nuiqsut Caribou Subsistence Monitoring Project has ranged from 6% to 18%. In the area directly east of the analysis area and directly west of the community of Nuiqsut, harvests have ranged from 14% to 43%, with recent years showing an increase in harvests coming from this area (SRB&A 2018a). Twelve percent of Utqiaġvik harvesters reported using the alternatives analysis area, primarily for wolf and wolverine, during the 1997 through 2006 time period.

For Nuiqsut, caribou is a resource of major importance, both culturally and as a food source, and the alternatives analysis area includes lands that are highly used for caribou hunting or lands that are directly west of areas highly used for caribou hunting (Figures 4 and 5). While furbearers generally are not a food source for the community, furbearer hunting and trapping has cultural value as it is a specialized activity, among highly active harvesters, which contributes to the local economy and provides materials for Native crafts and clothing. The alternatives analysis area is heavily used by furbearer hunters in Nuiqsut (Figure 6).

Thus, impacts to both caribou and furbearer resources are considered in this ANILCA Section 810 evaluation, in addition to indirect and cumulative impacts to other harvesting activities, such as fishing and waterfowl hunting, where applicable. Nuiqsut lies on the eastern periphery of the Teshekpuk Caribou Herd (TCH) range and the western periphery of the Central Arctic Caribou Herd (CAH) range. Estimates based on the timing and location of harvests indicate that a majority of Nuiqsut's caribou harvest is from the TCH, which is the primary herd that occurs within the alternatives analysis area (Braem, Kaleak et al. 2011). The CAH also contributes to the community's overall harvest, and caribou from this herd may cross to the west of the CRD on occasion. However, the CAH generally occurs east of the alternatives analysis area and impacts to harvests to this herd resulting from Alternative B would likely be minimal.

The alternatives analysis area is on the periphery of Utqiaġvik subsistence use areas but is directly east of the Teshekpuk Lake area, which is a key traditional use area for many Utqiaġvik residents (Figure 3). The alternatives analysis area is used during some years for hunting of wolf and wolverine and may be particularly important during years when these resources are less available elsewhere (Figure 7). Caribou may also be harvested during these furbearer hunting trips, but the alternatives analysis area is generally not used specifically for Utqiaġvik caribou hunting (SRB&A 2010b). Thus, the ANILCA Section 810 evaluation focuses on potential impacts to furbearer harvesting for Utqiaġvik, in addition to indirect or cumulative impacts to other resource harvesting activities. Like Nuiqsut, furbearer hunting is practiced by a relatively small proportion of households, but it is a culturally important and specialized activity in Utqiaġvik.

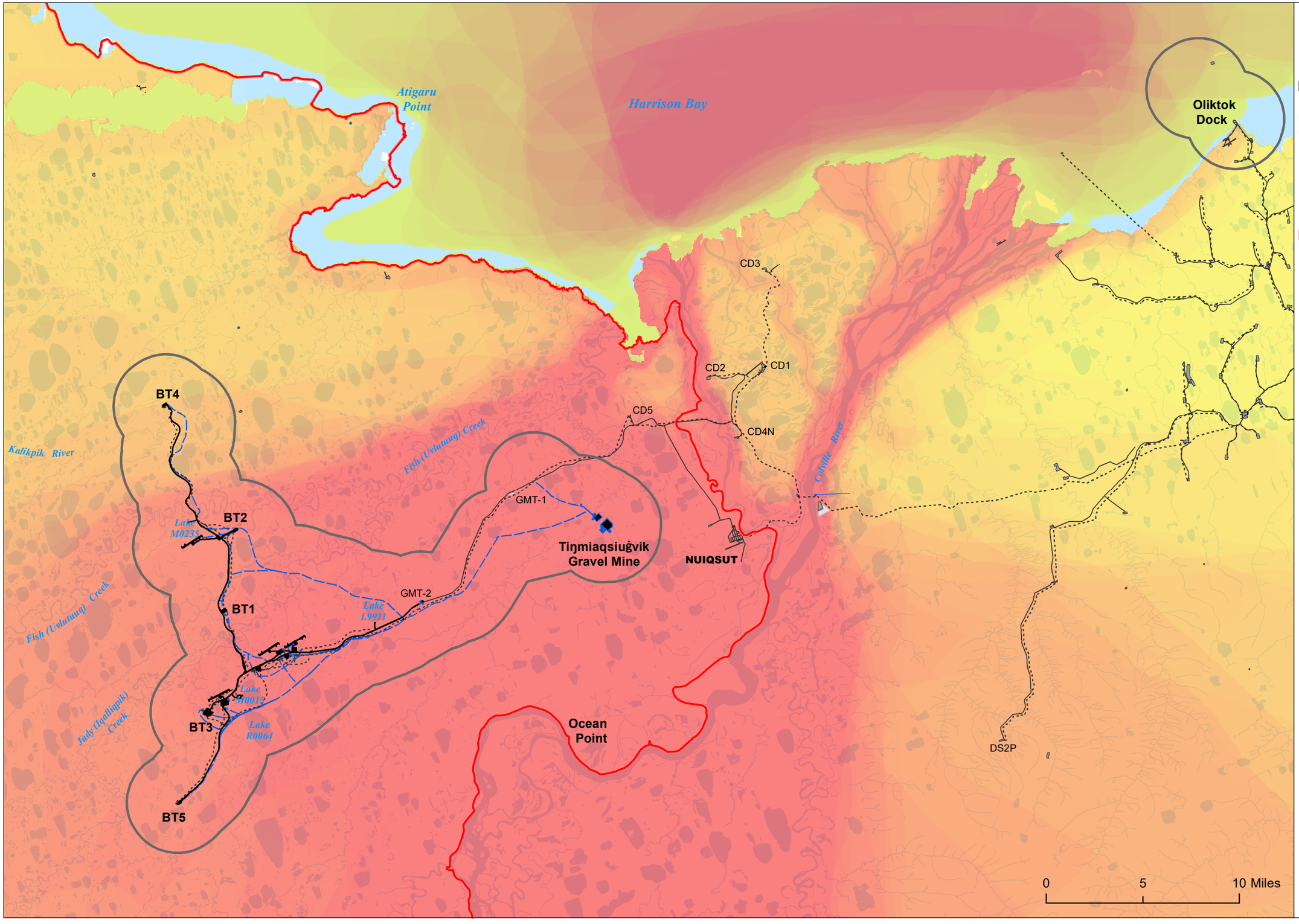
Subsistence Resource Abundance

As noted above, the TCH is the primary herd that occurs in the alternatives analysis area, with seasonal migrations occurring through the area during the spring and fall, and large numbers of caribou sometimes occurring in the area during the oestrid fly season (July through August), a peak hunting time for Nuiqsut

(Willow MDP Final EIS Section 3.12.1, *Affected Environment*). The alternatives analysis area occurs in areas of relatively low caribou calving density. Impacts to caribou populations could occur through direct mortality (e.g., vehicle strikes) or through decreased calf survival resulting from impacts to calving grounds or to the behavior of maternal caribou. Injuries and mortality resulting from vehicle collisions may occur but are not expected to have population-level effects (Willow MDP Final EIS Section 3.12.2.3.3, *Injury or Mortality*). In addition, while the Project may result in displacement of some calving caribou because the alternatives analysis area is located in low density calving areas for the TCH, displacement would likely not have population-level effects (Willow MDP Final EIS Section 3.12.2.3.2, *Disturbance or Displacement*). Thus, the abundance of caribou available for subsistence use would not be impacted under Alternative B.

The alternatives analysis area does not have a high density of wolves or wolverines, although the area is heavily used by Nuiqsut furbearer hunters who generally cover large areas in pursuit of these resources. While wolf and wolverine would likely be displaced by infrastructure and human activity and some individual mortalities of wolverine may occur, overall population levels are not expected to be affected by the Project (Willow MDP Final EIS Appendix E.12, *Terrestrial Mammals Technical Appendix*). Thus, the abundance of wolf and wolverine available for subsistence use would not be impacted under Alternative B.

While generally not harvested within the alternatives analysis area, other subsistence resources that could experience direct or indirect impacts from the Project include waterfowl and fish. Waterfowl hunting occurs to the north and east of the alternatives analysis area, while fishing of broad whitefish and other fish species occurs downriver from the alternatives analysis area in Fish (Uvlutuuq) Creek. Habitat loss and degradation could displace or cause individual mortalities of these resources, but the Project is not expected to cause population-level effects (Willow MDP Final EIS Section 3.10, *Fish*). A large oil spill could have population-level effects but is not expected to occur (Willow MDP Final EIS Sections 3.10, *Fish*, and 3.11, *Birds*).



Subsistence Data

High / Low — Overlapping Subsistence Use Areas All Resources, 1995-2006 [a]

Willow Proposed Development Features

- Alternative Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
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Source
a. SRB&A 2010a

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Figure 2

Atigaru Point
Harrison Bay
Oliktok Dock
CD3
CD2
CD1
CD5
CD4N
Colville River
BT4
Kalikpik River
Fish (Uvlutuuq) Creek
BT2
Lake M0235
GMT-1
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
GMT-2
Lake L9911
BT1
Fish (Uvlutuuq) Creek
Lake M0015
Judy (Iqalliqpik) Creek
BT3
Lake R0064
Ocean Point
BT5
DS2P
0 5 10 Miles

Subsistence Data
- High / Low: Overlapping Subsistence Use Areas All Resources, 1997-2006 [a]

Willow Proposed Development
- Alternative Analysis A
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
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Source
a. SRB&A 2010a

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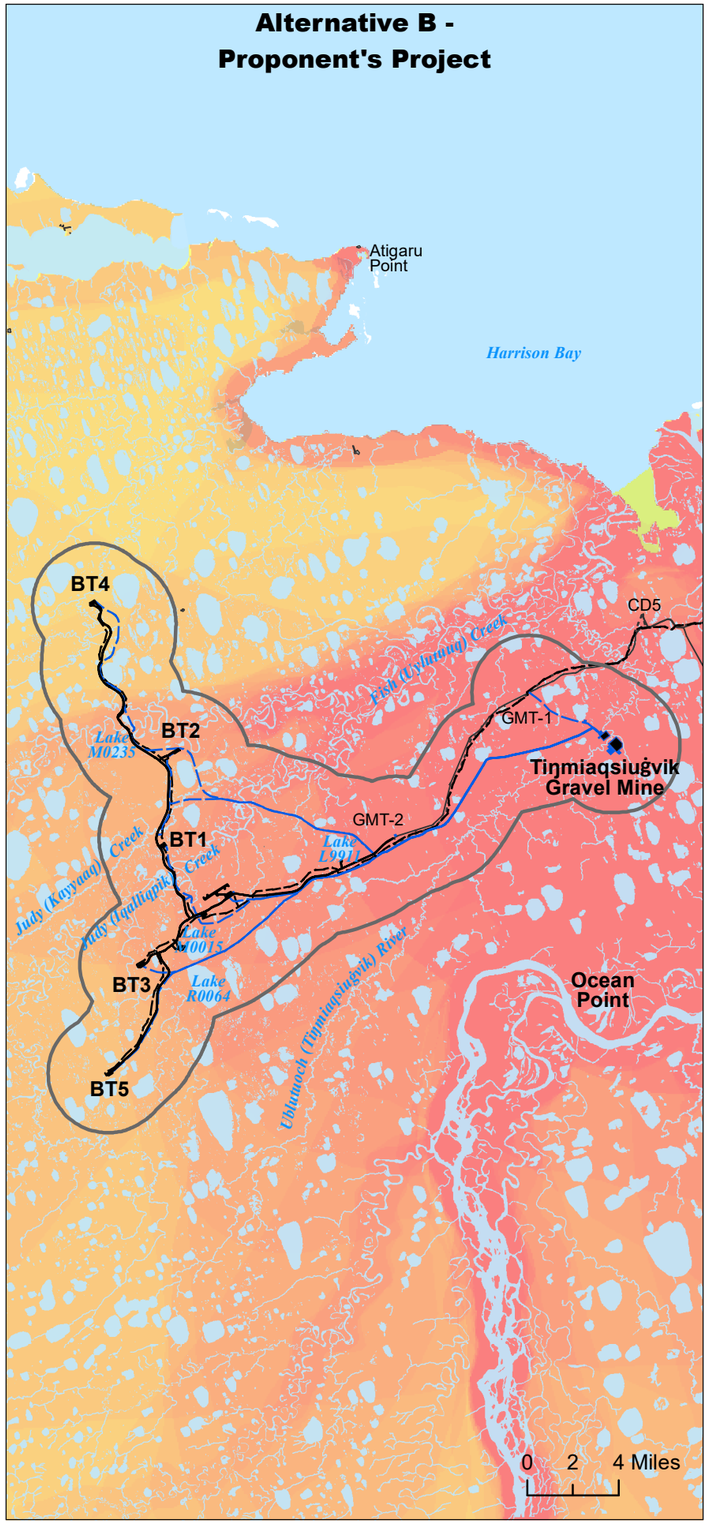
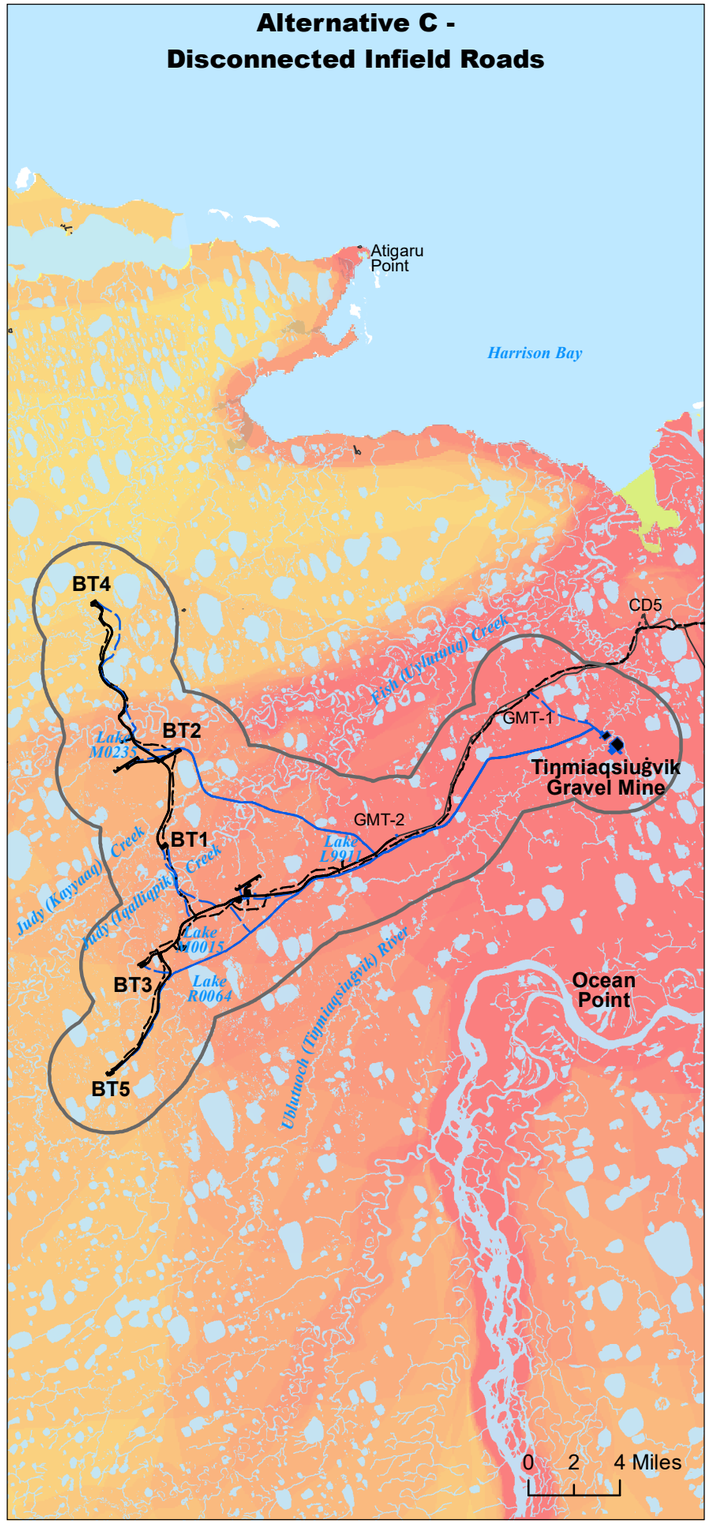
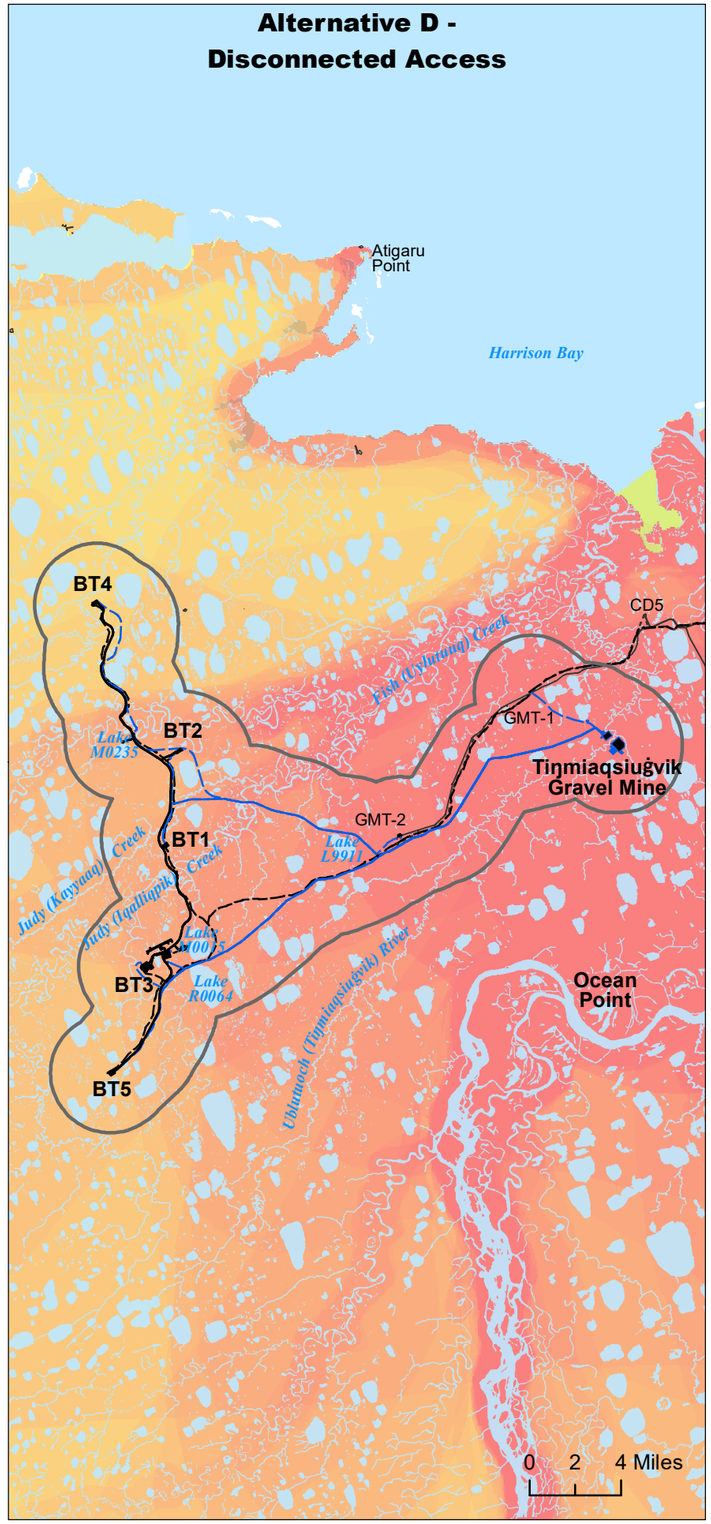
Figure 3







Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, 1995-2006[a]

Willow Proposed Development Features

- Alternative Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternative analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
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Source
a. SRB&A 2010a

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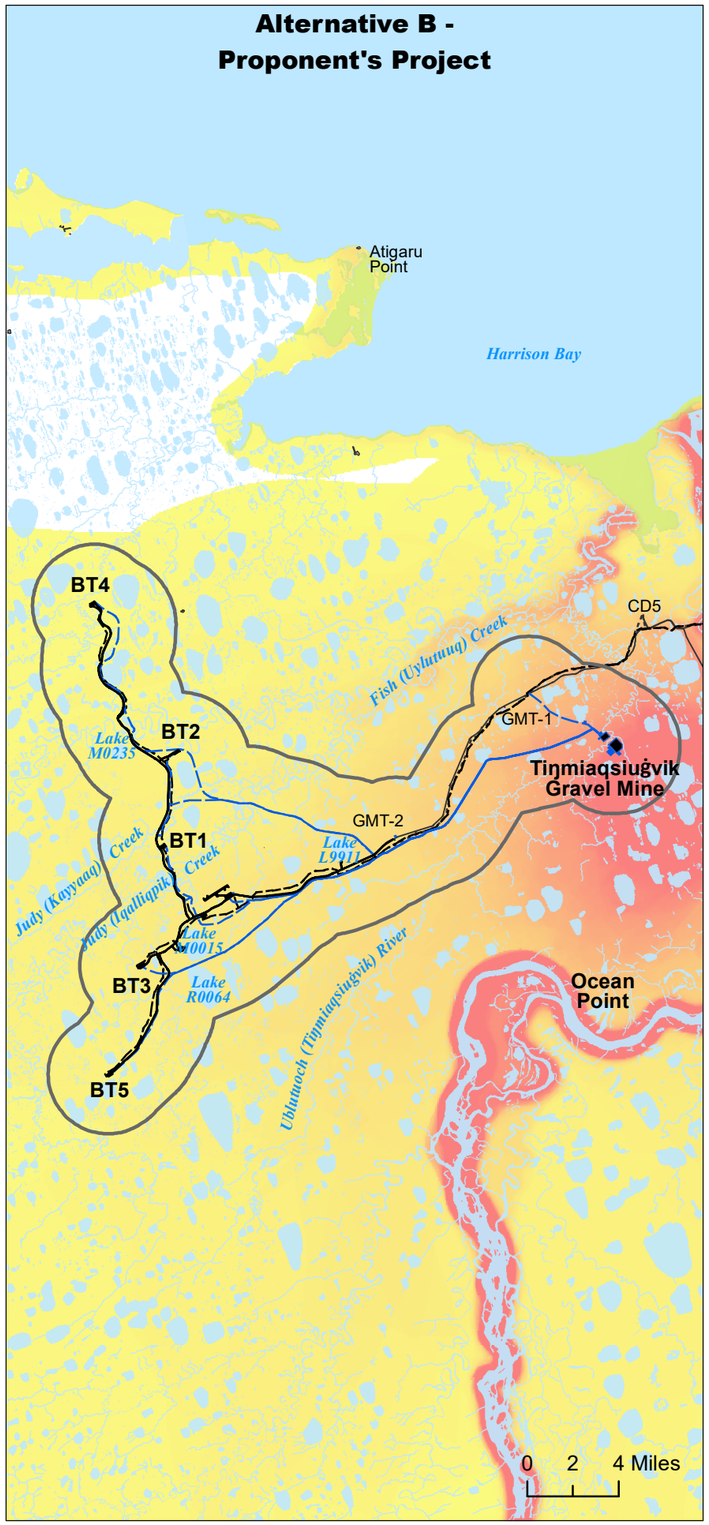
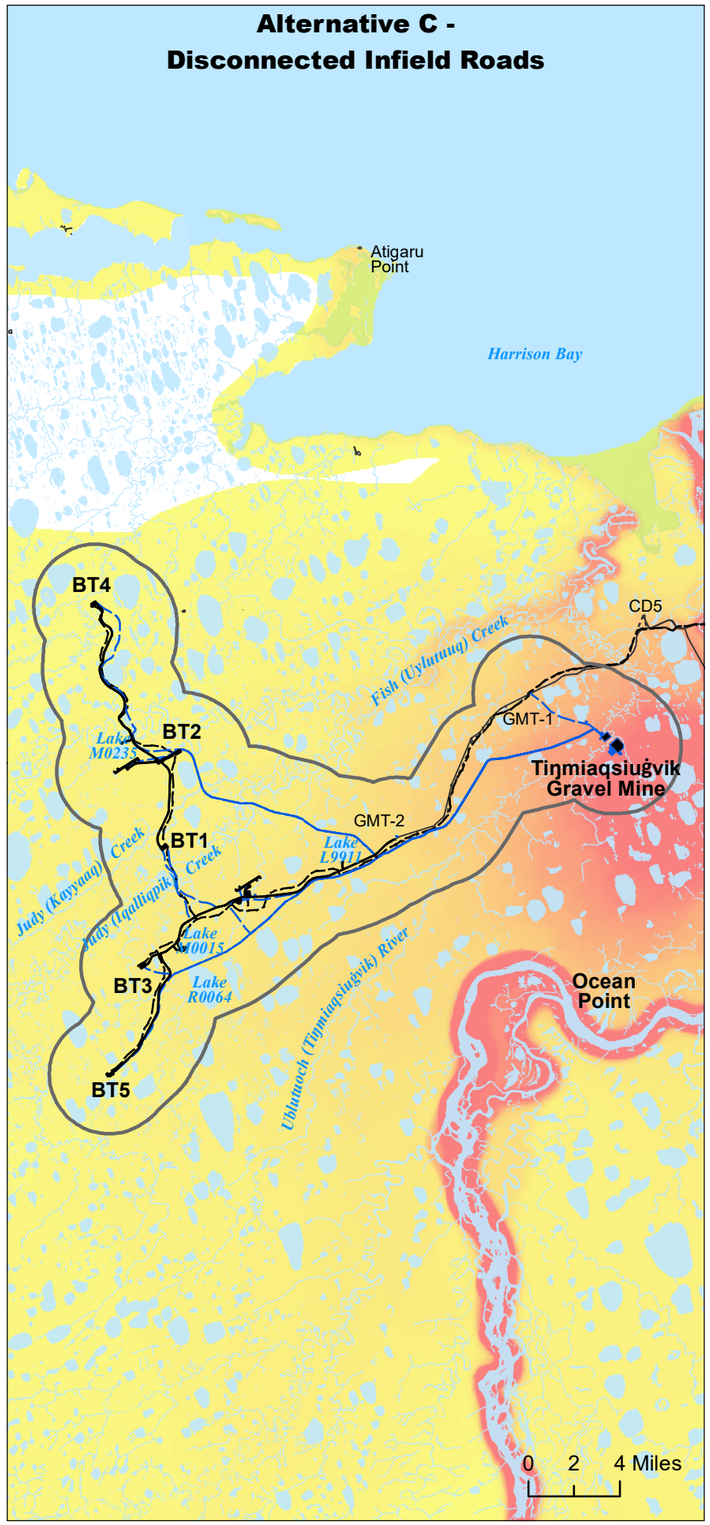
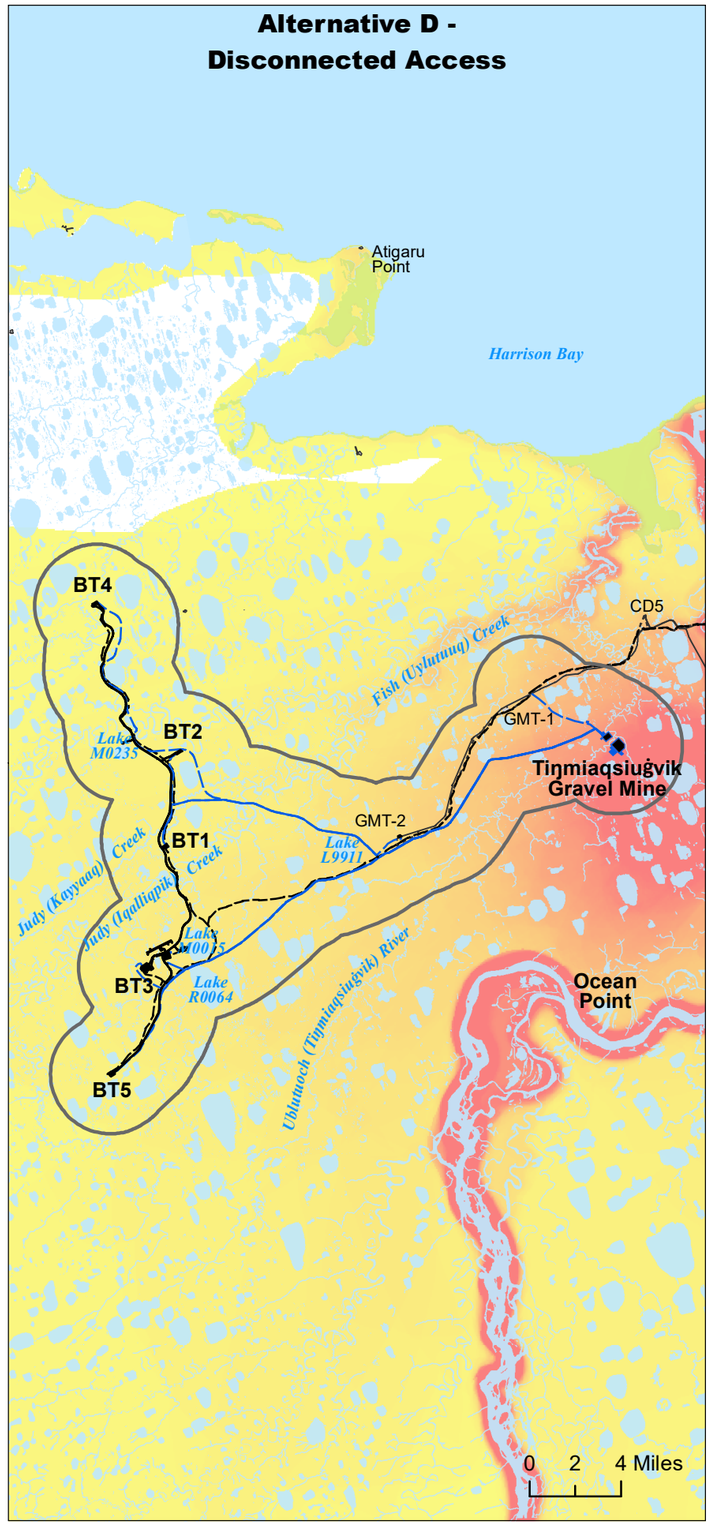
Figure 4







Subsistence Data

Overlapping Subsistence Use Areas Caribou, January 2008 through October 2016[a]
High
Low

Willow Proposed Development Features

- Alternative Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternative analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
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Source
a. SRB&A 2018

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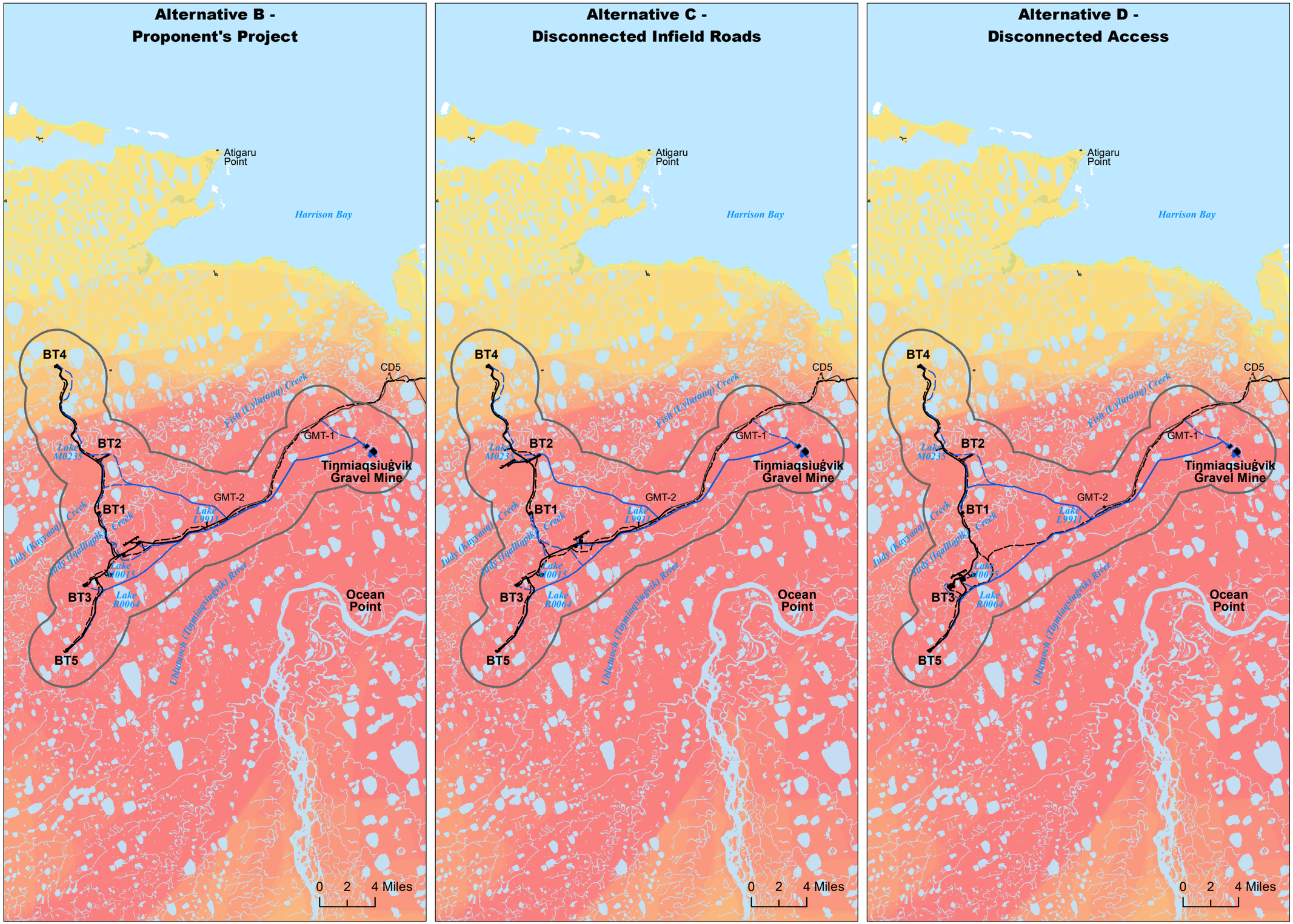
Figure 5

Alternative B - Proponent's Project

Alternative C - Disconnected Infield Roads

Alternative D - Disconnected Access



Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006[a]

Willow Proposed Development Features

- Alternative Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

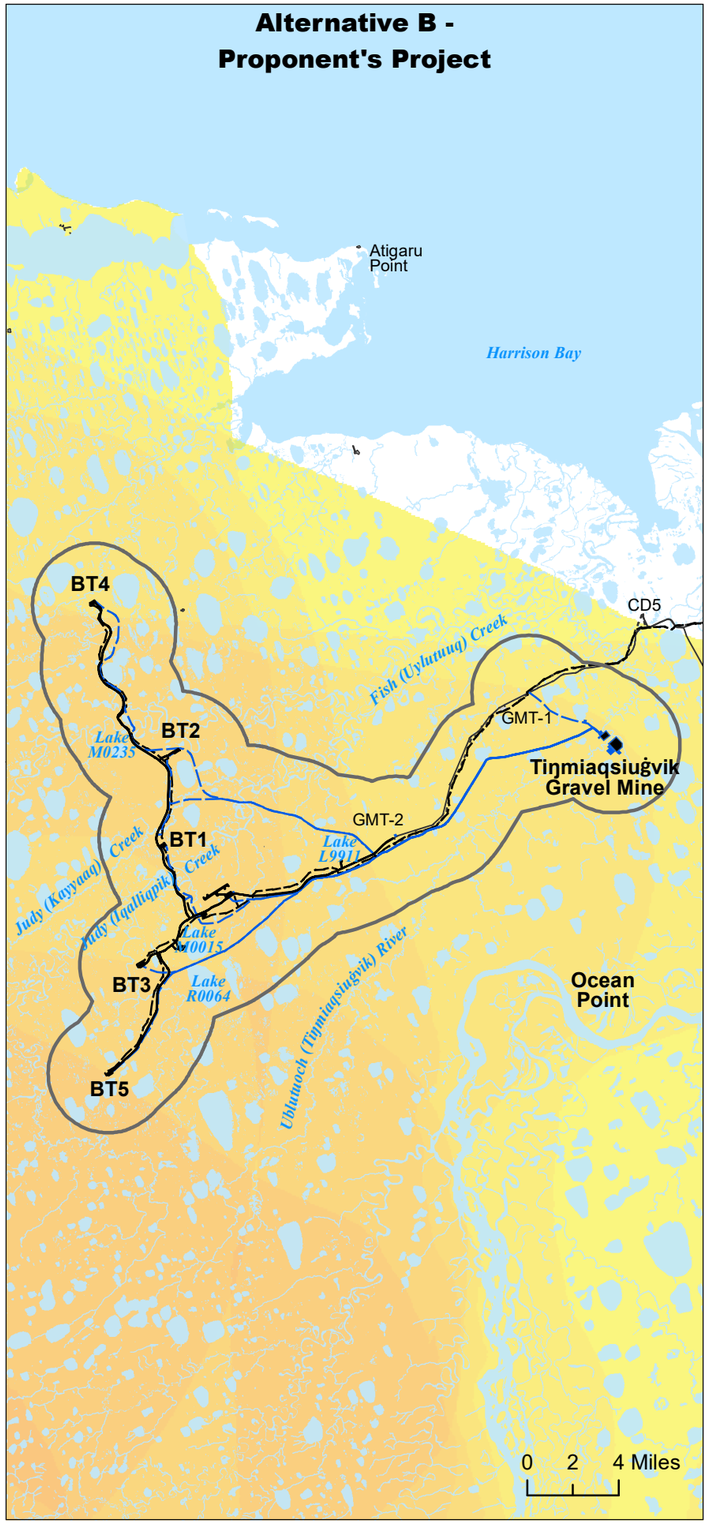
* The alternative analysis area also includes Oliktok Dock (see Figures 1 through 3)

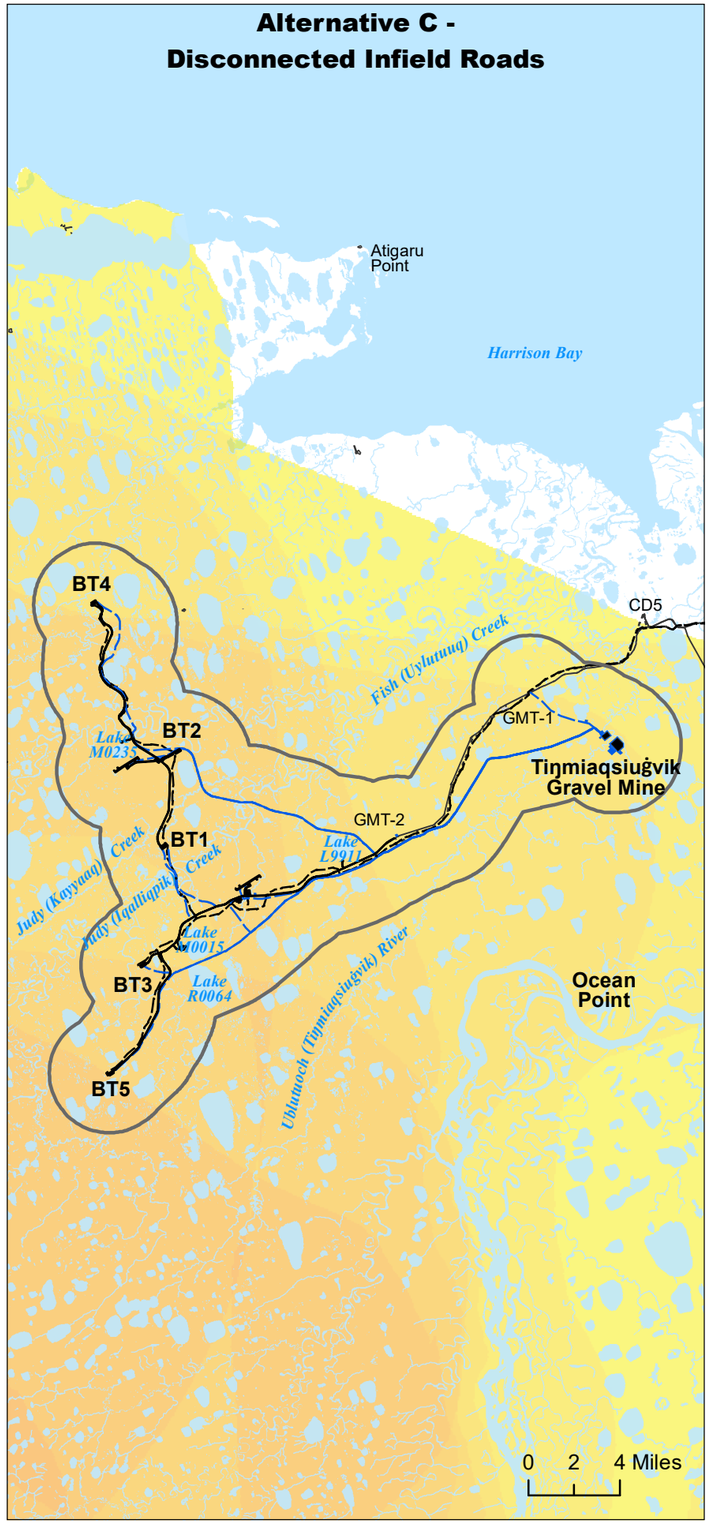
Map prepared by
Stephen R. Braund & Associates

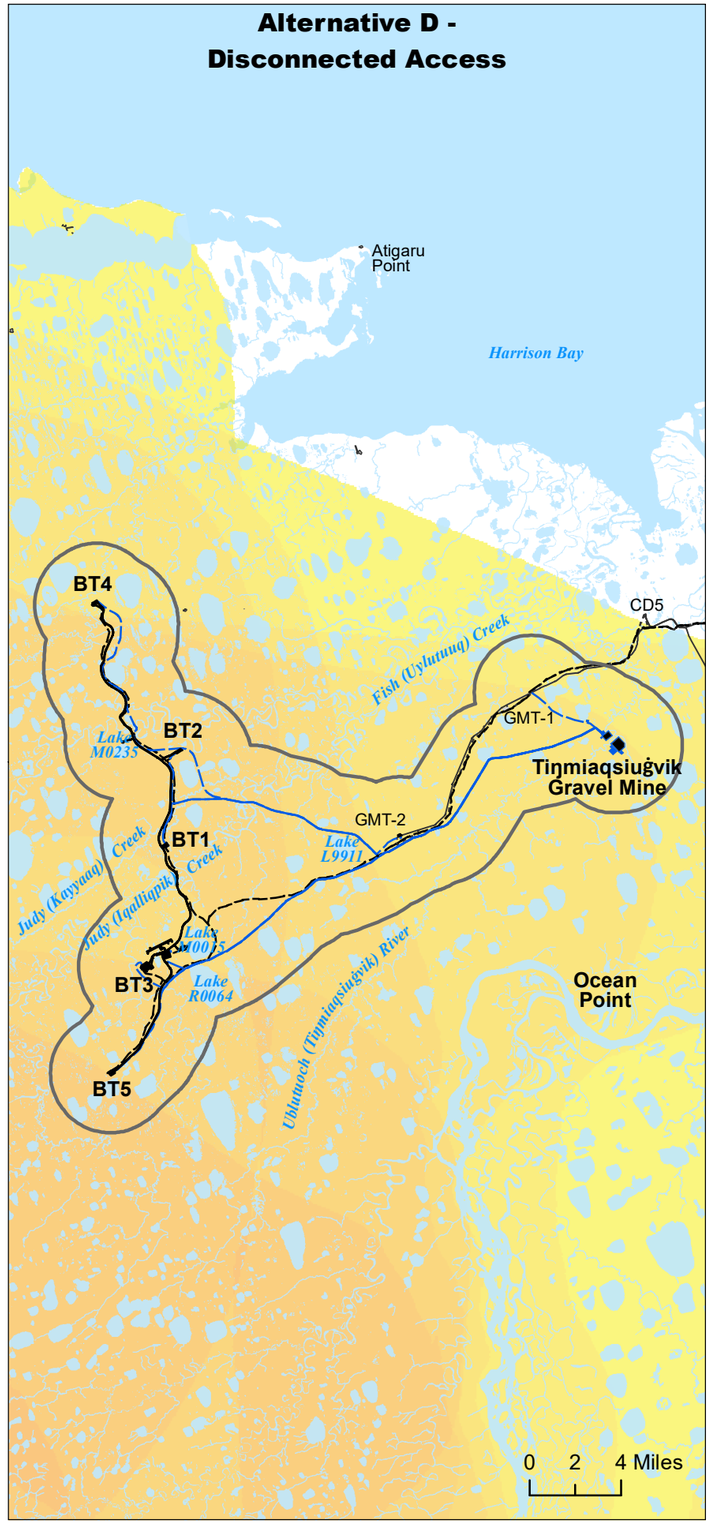
Source
a. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 6







Subsistence Data

Overlapping Subsistence Use Areas Wolf and Wolverine 1997-2006 [a]
(High / Low)

Willow Proposed Development Features

- Alternative Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

* The alternative analysis area also includes Oliktok Dock (see Figures 1 through 3)

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 7

Subsistence Resource Availability

A description of subsistence uses for Nuiqsut and Utqiaġvik is provided in Willow MDP Final EIS Section 3.16.1, *Affected Environment*, and in Willow MDP Final EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*. Nuiqsut caribou hunting primarily occurs along the Colville River drainage, including the Niġliq and East channels, as well as in overland areas to the west, southwest, and northwest of the community. While boat is the primary method of travel to caribou hunting areas along the Colville River, overland areas west of the community are primarily accessed by ATV, snow machine, and, since construction of the Kuukpik Spur, CD5, and GMT-1 roads, by automobile. Use of the area west of Nuiqsut for caribou hunting has increased somewhat in recent years, partially due to increased access from recently constructed gravel roads. The increase in subsistence use to the west of the community correlates with decreased use of other areas including Niġliq Channel, East Channel, and the Fish (Uvlutuuq) Creek drainage, which has been commonly reported as places of avoidance by local hunters due to development, environmental, and personal factors (SRB&A 2019). Nuiqsut caribou hunting activities in the direct effects analysis area peak from July through September, as does hunting directly east and south of the alternatives analysis area (Willow MDP Final EIS Appendix E.16). The majority of the use of the alternatives analysis area for caribou hunting occurs in the eastern portion of the area surrounding the proposed gravel mine and access road. Data for the 1995 through 2006 time period shows greater use of the alternatives analysis area; recent years have seen a decrease in use of snow machines and increased use of ATVs, which may partly explain the relatively smaller use areas shown on Figure 5 compared to Figure 4 (SRB&A 2018a). During years with adequate snow cover, use of the area may be higher. Nuiqsut caribou hunters often target caribou in the area west of the community while caribou are most available in the area during the oestrid fly season (July and August) and fall migration (August and September). During these time periods, caribou may cross through the Project and alternatives analysis area before being hunted to the west of the community.

Nuiqsut wolf and wolverine hunting is a winter subsistence activity that occurs in large overland areas to the west, south, and southeast of the community. For the 1995 through 2006 time period, 88% of wolverine harvesters and 87% of wolf harvesters reported using the alternatives analysis area. The majority of the alternatives analysis area is used heavily for wolf and wolverine hunting by Nuiqsut harvesters. Wolf and wolverine hunting in the area peaks from November through March and occurs by snow machine (Willow MDP Final EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*).

Potential impacts to the abundance of subsistence resources are discussed above. The primary sources of potential impacts to resource availability of caribou, wolf, and wolverine to subsistence users include:

1. Displacement resulting from habitat loss (roads, pipelines, and/or other oil and gas facilities).
2. Displacement resulting from road disturbance.
3. Displacement from air traffic.
4. Displacement from other infrastructure and sources of disturbance.

These impacts are discussed in further detail below.

Displacement of Caribou Due to Habitat Loss

Impacts on caribou related to habitat loss are discussed in Willow MDP Final EIS Section 3.12, *Terrestrial Mammals*. The Project area is to the east and south of the TCH primary calving grounds which, in recent years, occur with the greatest density to the southeast of Teshekpuk Lake. Alternative B would remove 616.1 acres of terrestrial mammal habitat due to gravel mining and construction of gravel infrastructure. Additional habitat loss or alteration would result from gravel spray and dust deposition. The habitats that would be affected by Alternative B are not unique, and similar habitats would be available nearby. Thus, habitat loss and alteration associated with the Project would likely cause caribou to move to similar habitats nearby and would not have overall impacts on subsistence resource availability for Nuiqsut harvesters.

Displacement of Caribou Due to Road Disturbance

Impacts on caribou and caribou hunting resulting from road-related disturbance are discussed in Willow MDP Final EIS Sections 3.16.2.3.2.1, *Resource Availability–Caribou*, and 3.12.2.3.2, *Disturbance or Displacement*. The increasing presence of roads near Nuiqsut has resulted in increased reports of impacts to hunting from roads and road traffic (SRB&A 2016, 2017a, 2018a). As noted above, the Project area would be in the northeastern portion of the range of the TCH. In the spring (May and June), some TCH caribou migrate through the Project area on their way to calving grounds, with males arriving in mid- to late-June when Nuiqsut residents begin traveling by boat to hunt caribou. In the summer oestrid fly season (July and August), caribou sometimes occur in the area of proposed infrastructure in large numbers, and in the fall, large numbers of caribou may move through the Project area as they migrate south to their wintering grounds (Prichard, Macander et al. 2018).

The Alternative B Project access road would bisect a portion of the fall migration corridor and would occur in areas heavily used by TCH caribou in some years (during both the summer and winter months). Residents hunt to the west, northwest, and southwest of the community of Nuiqsut during the summer and fall by ATV, and they hunt to the northwest of the community by automobile. In addition, residents hunt caribou by boat along the Colville River to the southeast of the proposed road corridor in the months of July, August, and September (Willow MDP Final EIS Appendix E.16). While the majority of this hunting occurs in the eastern portion of the alternatives analysis area near the proposed mine site and directly east of the proposed road, some residents also travel as far as the proposed gravel road, particularly when using the existing road system to access hunting areas. The most heavily used hunting areas are directly east and northeast of the proposed access road. Some caribou may remain in the Project area throughout the winter and are hunted by individuals on snow machine or, in recent years, along the road. While the number of caribou that occur within the alternatives analysis area may represent a small portion of the overall herd, they represent an important source of caribou available to the community of Nuiqsut. Thus, roads associated with the Project have a high potential for disturbance of caribou and Nuiqsut caribou hunting activities. While some Utqiaġvik hunters may venture into the western portion of the alternatives analysis area in some years during winter, the area is not a primary hunting area for caribou for that community. Thus, this discussion focuses on potential impacts to Nuiqsut hunters resulting from road disturbance.

Roads and road traffic are believed to cause behavioral and migratory changes in caribou that can affect hunting success. Deflections or delays of caribou movement from roads and associated ground traffic and human activity have been documented both by active harvesters (SRB&A 2010a, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2018a) and during behavioral studies on caribou (Wilson, Parrett et al. 2016). During the Nuiqsut Caribou Subsistence Monitoring Program, reports of road-related impacts on caribou hunting have steadily increased since road construction began. Year 9 of the study was the first year where impacts related to man-made structures (e.g., roads, pipelines) were as common as impacts related to helicopter traffic (SRB&A 2018a). In Year 10, when constructed roads included the Spur, CD5, and GMT-1 roads, impacts from human-made structures were the most commonly reported impacts (SRB&A 2019). Residents indicate that the roads pose both a physical and visual barrier to the caribou and have observed changes in caribou distribution and behavior around roads, including decreased availability of caribou closer to the community (SRB&A 2019). Residents also note that safety considerations around roads reduce the availability of individual caribou as residents are careful not to shoot toward infrastructure.

Avoidance of roads is particularly common for maternal caribou (displacement of between 0.6 and 3.1 miles [1 and 5 kilometers] from roads) (Willow MDP Final EIS Section 3.12, *Terrestrial Mammals*). Displacement of calving caribou would likely not have direct effects on hunter success, as hunting during the spring calving season is low and the hunting that does occur focuses on males. During the mosquito and oestrid fly seasons, caribou are highly mobile due to insect harassment and regularly approach and cross pipelines; however, deflected movements and delays become common where roads and pipelines are close to one another or where traffic rates exceed 15 vehicles per hour (Willow MDP Final EIS Section 3.12). Deflections or delays of several hours could have substantial impacts to harvesting success

for residents hunting to the east of the road corridor, particularly hunters waiting along river corridors with no means of approaching delayed herds. Traffic rates of over 15 vehicles per hour would be more common during construction, and therefore decreased hunting success resulting from delayed caribou crossings would be more frequent during the construction period. It is likely that caribou deflections would continue during operations but at a lower intensity and frequency than during Project construction. In addition to increased road traffic along Project roads, development of the Project would also increase road traffic along existing roads connecting the Project area to Greater Mooses Tooth (GMT) and Alpine developments. Thus, impacts related to roads would extend beyond the alternatives analysis area.

Caribou tend to follow linear infrastructure when they are placed parallel to the herd's primary movement (Willow MDP Final EIS Section 3.12), though perpendicular roads can also intercept caribou and cause delayed crossing (BLM 2018; CPAI 2018). The Alternative B access road, where it intersects with infield roads near the WPF, WOC, and airstrip, could create a "pinch point" and deflect caribou away from the road during the fall migration. An overall deflection of migration could have substantial impacts to residents hunting caribou in overland areas during the fall. Temporary changes in distribution have not been shown to alter overall migration patterns or herd distribution (Willow MDP Final EIS Section 3.12); however, small changes in caribou distribution and movement from a biological perspective can have large impacts on hunter success as residents are generally limited in how far and fast they can travel, particularly during the snow-free season. Because Nuiqsut is on the periphery of the two caribou herds which they rely upon (Prichard, Macander et al. 2018), they are particularly vulnerable to small changes in overall herd distribution or migration.

Caribou responses to roads seem to vary from year to year based on the context in which roads are encountered; thus, while Project roads may not deflect caribou during all seasons or years, in some years, deflections or delays could take place (Willow MDP Final EIS Section 3.12). The likelihood of deflections would be higher during construction, when traffic levels would regularly exceed 15 vehicles per hour. Based on available data, it is not possible to predict the exact frequency or intensity at which deflections would take place. However, it is reasonable to conclude that caribou would be deflected from Project roads in some years, resource availability would be affected as a result of such deflections, and subsistence hunters may experience decreased hunting success during those times.

According to CPAI (2018), the TCH may be less habituated to development activity than the CAH due to the relative lack of infrastructure within its range. Thus, TCH caribou may be more prone to disturbance than the CAH (Willow MDP Final EIS Section 3.12). Impacts on resource availability would most likely occur during the summer and fall months when caribou hunting activity in overland areas and along the Colville River is highest (Table E.16.7 in the Final EIS Appendix E.16). During the oestrid fly season, groups of caribou could gather on gravel pads and gravel roads for insect relief; which may result in increased availability of caribou for individuals hunting along roads but may also increase the likelihood of vehicle strikes and mortalities. Individuals not using roads to access caribou may experience reduced success closer to Nuiqsut, as the caribou are delayed or deflected from crossing roads toward the community's primary hunting area west of the community or along the Colville River toward Ocean Point. Increased hunting along the road corridor could also reduce the availability of caribou for hunters along river corridors or to the east of the road corridor.

Overall caribou harvests for the community of Nuiqsut as a whole have remained stable over time (during study years spanning the 1980s through 2017) (SRB&A 2019). Residents have reported that access to roads has offset some of the impacts of increased infrastructure and activity on resource availability by providing hunting access to areas farther from the community, although some report avoiding the roads altogether. Use of roads, and use of trucks to hunt for caribou, increased substantially after the Kuukpik Spur Road was built. While road use, in terms of the percentage of active harvesters, has continued to increase since then, the percentage of harvests occurring within the developed area has remained relatively stable, suggesting that the presence of roads has not had a net benefit on resource availability although it has increased harvester access to this area (SRB&A 2019).These conclusions are based on only 4 years of post–road construction data, and hunting patterns will likely continue to change and adapt

to the increasing presence of roads. Consequently, it is difficult to draw conclusions at this time regarding the magnitude of impacts of the CD5, GMT-1, and recently built GMT-2 roads based on existing data. Impacts of roads on resource availability will vary from year to year and will depend on multiple factors including traffic rates, environmental factors affecting caribou movement, and hunter adaptation to changes.

Displacement of Caribou Due to Air Traffic Disturbance

During construction, fixed-wing airplanes would be the primary source of air traffic, with helicopters used to support ice road construction, surveying, and monitoring (CPAI 2018). Once the airstrip is constructed, air traffic to the Project area would likely increase to multiple daily flights throughout the life of the Project, although at slightly lower levels during the drilling and operations phases. Helicopter traffic would occur on a periodic basis throughout the life of the Project.

Caribou responses to air traffic disturbance and related impacts on caribou hunters are discussed in Willow MDP Final EIS Sections 3.12, *Terrestrial Mammals*, and 3.16, *Subsistence and Sociocultural Systems*. Until recently, air traffic, particularly helicopter traffic, has been the most commonly reported impact on caribou hunting to the Nuiqsut Caribou Subsistence Monitoring Project (CPAI 2018; SRB&A 2018a, 2019). Air traffic could cause direct and indirect disturbances to caribou availability both within and outside of the alternatives analysis area. Nuiqsut hunters have observed that caribou behavior often changes in response to air traffic, particularly helicopter traffic and fixed-wing traffic at low altitudes. Observed behavioral responses include caribou "scattering" rather than remaining in groups where they are easier to hunt, acting skittish, and deflecting away from the source of noise or away from riversides (where hunters wait for them) (SRB&A 2010a, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2018a). Hunters have frequently recounted experiences where a potentially successful harvest was disrupted by air traffic overhead, with caribou diverting to locations too far from riversides for hunters to access.

Increased air traffic associated with the Project would likely affect hunting activities in overland areas and along rivers, including the Niġliq Channel and the Colville River upriver toward Ocean Point. The increase in overall air traffic in the region associated with the Project would increase the frequency of disturbances experienced by Nuiqsut hunters. According to SRB&A (SRB&A 2018a), the area west of Nuiqsut accounts for a substantial percentage of Nuiqsut's annual caribou harvest, and increased air traffic within that area could affect Nuiqsut harvesting success during the construction and operation phases. Impacts of air traffic to caribou resource availability would be most likely during the summer oestrid-fly season and in the fall when caribou migrate in an easterly direction, often crossing through the Project area into areas heavily used by Nuiqsut caribou hunters (Willow MDP Final EIS Figures 3.16.7 and 3.16.8; Figure E.16.2 in Willow MDP FEIS Appendix E.16). However, air traffic impacts could occur year-round.

Displacement of Caribou Due to Other Infrastructure and Sources of Disturbance

Other potential sources of impacts to caribou availability include construction noise (including noise associated with gravel mining), drilling noise, general human activity, and contamination events. These potential impacts to Nuiqsut subsistence resource availability are discussed in Willow MDP Final EIS Section 3.16, *Subsistence and Sociocultural Systems*. Noise associated with gravel mining (including blasting), mining equipment and machinery, and excavation, could cause caribou to avoid the mine site area or to act skittish. Blasting and excavation would occur over five construction seasons, primarily during the winter months, when caribou hunting levels are reduced. While winter is not the peak caribou hunting season for the community of Nuiqsut, harvests occur when caribou are available in the area and when households are in need of meat. Winter harvests are often an important source of food when stocks of summer and fall subsistence foods begin to run low. Winter caribou harvests have been documented occurring to the west and north of the community, including near the proposed mine site. Access to winter ice roads may help offset some of the impacts to resource availability during this time; however, gravel haul ice roads, which would be the primary ice roads located within the community's hunting area, would be off-limits to subsistence users. Module transport ice roads would see less traffic than gravel haul ice roads and community use would be restricted only during ice road construction and active hauling of the

modules. In addition to noise associated with mining, the presence of the mine pits could deflect movement of caribou year-round, resulting in localized changes in distribution. The mine pits would be allowed to fill with water following construction and would therefore no longer be suitable habitat for caribou, thus affecting availability of caribou in the immediate area.

Other disturbances associated with construction noise, general equipment operation, human presence and activity, and drilling noise could result in temporary avoidance behavior or deflection of caribou, thus affecting resource availability. Studies show that caribou, especially females with calves, avoid drilling sites, and caribou that do approach drilling sites spend less time feeding and lying down (Fancy 1983; Lawhead, Prichard et al. 2004).

Resources which are perceived as contaminated by subsistence users are often considered unavailable for subsistence use (SRB&A 2009); during a recent Bureau of Ocean Energy Management–funded study, 47% of Nuiqsut households reported avoidance in the previous year of certain subsistence foods due to concerns about contamination (SRB&A 2017b). Use and storage of hazardous materials, solid waste, and drilling waste; generation of air emissions; treatment and disposal of wastewater; and dust deposition, could result in real or perceived degradation of caribou habitat. If individuals perceive or confirm caribou to be contaminated and avoid harvesting caribou that feed near the Project, they may experience reduced caribou resource availability.

Displacement of Furbearers

Potential disturbances of wolf, wolverine, and other furbearers are discussed in Willow MDP Final EIS Section 3.16, *Subsistence and Sociocultural Systems*, and in Appendix E.12, *Terrestrial Mammals Technical Appendix*. Wolf and wolverine are the primary furbearer resources harvested by Nuiqsut and Utqiaġvik subsistence users in the Alternative B analysis area. Although a higher number of overall caribou harvesters use the area, a higher percentage of wolf and wolverine harvesters—individuals who generally represent a smaller portion of the population and tend to be particularly active harvesters—use the area. During the construction phase, noise and other potential sources of impacts would be highest in winter, when most construction activities (e.g., pile driving, gravel mining, ice road operation) would occur. These activities would displace furbearers near Project activities.

Furbearer harvesters have observed reduced availability of wolf and wolverine near development and human activity, noting their sensitivity to noise and human activity, and their general tendency to avoid developed areas. Throughout the life of the Project, furbearers are likely to avoid areas with equipment and infrastructure or areas with high levels of human activity, noise, and ground traffic. Ground traffic and construction and mining noise would be highest during the winter construction months when furbearer harvesting activities are at their peak. Construction is expected to occur over a period of approximately 7 years with varying levels of intensity. Because wolf and wolverine hunting areas are generally large, accessible by snow machine, and extend in various directions from the community, residents would likely use different areas where the resources are believed to be more available, particularly during the construction phase. However, in some cases, subsistence users may have to expend more effort or go farther because the area to the west of the community is a commonly used and easily accessible area. Operations impacts would be similar to construction but would continue throughout the life of the Project (30 years) at somewhat lower levels. For Nuiqsut, high numbers of overlapping use areas for wolf and wolverine occur around BT1, BT2, BT3, and BT5, while low to moderate overlapping use areas occur around BT4. For Utqiaġvik, low to moderate overlapping use areas occur throughout the western portion of the alternatives analysis area, with greater intensity to the west and southwest of the analysis area.

Displacement of Other Resources

While caribou, wolf, and wolverine are the primary resources harvested directly within the alternatives analysis area, goose hunting occurs directly to the east and north of the mine site and to the east of the proposed gravel access road along the Colville River, fishing (primarily for broad whitefish, a key resource for the community of Nuiqsut) occurs downstream from the alternatives analysis area on Fish

(Uvlutuuq) Creek, and seal and eider hunting occurs in Harrison Bay near Oliktok Dock. Waterfowl hunting peaks during May when residents travel by snow machine to inland and riverine areas where white-fronted goose is known to be abundant (Willow MDP Final EIS Appendix E.16). While most construction activity would be complete before goose hunting begins, it is possible the ice road season would overlap with the beginning of the waterfowl hunting season in late April. Additionally, blasting at the gravel mine pits may occur into April. Thus, traffic and mining noise may result in temporary displacement or disturbance of waterfowl at the beginning of the hunting season, potentially causing a temporary decrease in harvester success; however, these disturbances are not expected to cause overall impacts to resource availability for the community as the mine site and ice roads are at a substantial distance from areas of high overlapping use for goose hunting, and activities would likely cease before the primary goose hunting season began (Willow MDP Final EIS Sections 3.11, *Birds*, and 3.16, *Subsistence and Sociocultural Systems*).

While the Colville River and CRD are the primary fishing areas for the community of Nuiqsut, a number of families travel to Fish (Uvlutuuq) Creek and stay at fish camps to set nets for broad whitefish during the summer (July and August) and fall (September and October) months (SRB&A 2010b). Other fish resources harvested along Fish (Uvlutuuq) Creek, although in lesser quantities than broad whitefish, include burbot (in winter), Dolly Varden, and Arctic grayling (SRB&A 2010b). While construction activities, noise, and infrastructure (e.g., ice roads) may temporarily block or displace fish upstream and downstream, these impacts would be relatively localized and would not be likely to affect harvesting activities that generally occur a substantial distance downstream along Fish (Uvlutuuq) Creek (Willow MDP Final EIS Section 3.10, *Fish*). In addition, ice infrastructure over stream channels would be removed, breached, or slotted before spring breakup to minimize blocked fish passage (Willow MDP Final EIS Section 3.10). Water withdrawals to support ice infrastructure construction could alter fish habitat in some freshwater lakes, but these alterations would be temporary and are not expected to affect fish populations in Fish (Uvlutuuq) Creek (Willow MDP Final EIS Section 3.10). Use of lakes in the alternatives analysis area for fishing is limited (see Willow MDP Final EIS Appendix E.16). The primary potential impacts to fish resource availability would be related to real or perceived contamination of the Fish (Uvlutuuq) Creek drainage. If a spill occurs or if residents perceive that activities upstream from their fish camps are contaminating the water, they may perceive that the fish are unsafe to eat and reduce harvesting activities in the area (Willow MDP Final EIS Section 3.16). Although unlikely, a larger oil spill could affect residents' fish harvesting in the Fish (Uvlutuuq) Creek drainage in the long term.

Oliktok Dock would be used under all action alternatives for the delivery of Project construction materials. Nuiqsut harvesters use the offshore area near Oliktok Dock to hunt bearded seal (41% of harvesters), ringed seal (35%), and eiders (39%). Increased barge and vessel activity would occur in an area of low to moderate offshore Nuiqsut subsistence use for these resources, with areas of high overlapping use occurring directly west of the dock area in Harrison Bay. Increased barge and vessel traffic in the vicinity of Oliktok Dock, in addition to noise associated with screeding and lightering, could displace eiders and seals in the vicinity of these activities. However, activities at Oliktok Dock would occur in areas of existing industrial disturbance and would not involve the construction of new infrastructure; therefore, these activities would be additive rather than introduce impacts into previously undeveloped areas.

Several other resource uses have been documented in and around the alternatives analysis area but are not regularly documented and not considered to be primary uses of the area. These include moose hunting and vegetation harvesting along Fish (Uvlutuuq) Creek. Moose are rare within the Project area, and eider hunting occurs primarily in offshore and nearshore areas of Harrison Bay. Vegetation harvesting has been documented along Fish (Uvlutuuq) Creek; however, it is unlikely that impacts to vegetation resulting from dust deposition would extend to harvesting areas downstream from the Project.

Access to Subsistence Resources

Potential impacts to harvester access are discussed in Willow MDP Final EIS Section 3.16. A 1,000-foot safety radius around all Willow facilities would be in place and would prohibit the discharge of firearms

within those areas; additionally, CPAI asks hunters not to shoot in the direction of work areas, human activity, and infrastructure. In certain areas, the presence of infrastructure and human activity, and associated safety considerations, could reduce the area in which residents can hunt by up to 2.5 miles, depending on the firearm being used (Willow MDP Final EIS Section 3.16). Thus, a portion of traditional harvesting areas would be inaccessible to subsistence users from construction through the life of the Project. However, Nuiqsut subsistence users would be permitted to use most roads to access subsistence harvesting areas as long as they follow established security protocols, and hunters do use areas and harvest resources within 2.5 miles of existing roads. Gravel haul ice roads would generally be off limits to Nuiqsut harvesters due to heavy traffic levels. Module transport ice roads would see less traffic than gravel haul ice roads; these roads would be restricted from local use during ice road construction and the active hauling of the modules, with some potential for periods of local use. Thus, while much of the Project footprint would be legally accessible to subsistence users throughout the life of the Project, certain areas, particularly during construction activities, would be inaccessible to local residents and may result in residents having to divert around infrastructure to access subsistence harvesting areas, or may act as a physical barrier or obstruction to harvester access. Additionally, the presence of humans and infrastructure would affect subsistence harvesting patterns in and around the development area due to safety concerns, thus rendering some areas unusable for subsistence purposes under certain conditions.

During much of construction, access to the Project area would be limited to overland travel or via ice roads during winter, which would be open from February to April, but would be limited to ice roads not used for gravel hauling or module transport activities. Some residents—particularly those without snow machines—may use ice roads to access caribou herds farther from the community if they are not available closer by. However, the gravel haul ice roads, which are close to the community's hunting areas, would be off limit to subsistence users, and individuals traveling by snow machine may have difficulty crossing over these ice roads safely due to high traffic volumes. While the winter is not a primary hunting time for caribou, residents do hunt this resource, particularly in February and March (SRB&A 2018a) to supplement their diet as needed throughout the winter. It is unlikely that furbearer hunters would use ice roads for wolf and wolverine hunting, as most individuals would begin snow machine hunting trips directly from the community and are not expected to hunt for these resources near human activity and infrastructure. If wolf and wolverine hunters want to cross over gravel haul and module transport ice roads to access areas farther from the community, they may experience difficulties due to the high traffic volumes and access restrictions. As gravel roads are gradually constructed, year-round access to the Project area via road automobile would increase. Gravel roads would extend the current area accessible by automobile for local residents and would likely be used, to some extent, for summer and fall caribou hunting, as well as during the winter. Use of roads would be particularly likely for residents who do not have access to alternate modes of transportation (e.g., boats, snow machines, ATVs), who have limited time to engage in subsistence activities, or who have health or other issues that make overland travel difficult.

In addition to Project roads, under Alternative B (Proponent's Project), CPAI would construct up to three boat ramps specifically for subsistence use. One of the boat ramps (common to all action alternatives) would provide access to the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and GMT-1. Up to two additional boat ramps would be constructed along Judy (Iqalliqpik) Creek and/or Fish (Uvlutuuq) Creek pending further community input. The boat ramps would be accessible from existing Project roads with the addition of short access roads. Subsistence mapping data indicate limited travel along the Ublutuoch (Tiŋmiaqsiuġvik) River by boat; however, if it is possible for individuals to access Fish (Iqalliqpik) Creek via the Ublutuoch (Tiŋmiaqsiuġvik) River using boats (Figure 3.8.3 in Appendix A, *Figures*), the boat ramps could have substantial benefits to some users. Use of Fish (Iqalliqpik) Creek for subsistence purposes has declined in recent years with residents citing fuel costs and difficult travel and navigation conditions (e.g., shallower waters near the mouth of Fish [Iqalliqpik] Creek) for the decline in use. A boat ramp that facilitates access to Fish (Iqalliqpik) Creek could increase use of this traditionally important subsistence harvesting area. Of the three proposed boat ramps, residents would be most likely to use the boat ramp closest to the community (on the Ublutuoch

[Tiŋmiaqsiuġvik] River), as it would require less travel and would provide more immediate access to the lower, most heavily used portions of Fish (Iqalliqpik) Creek where most traditional camps are located. However, the boat ramps farther upriver on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks would also provide a benefit to the community, particularly in the event that the Project reduces the availability of certain resources, such as caribou, near the community. Accessing the upriver areas of Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks would allow residents to access areas that are currently not frequently used due to the long boat ride from the community, high costs associated with such travel, and reported difficulties in recent years navigating into the mouth of Fish (Iqalliqpik) Creek by boat. Access to these areas may result in a shift to the community's boat hunting areas, but it could also provide access to new areas with greater concentrations of caribou in areas that are considered less affected by development (e.g., to the west of the current Prudhoe Bay/Kuparuk/Alpine development complex).

Preliminary data from Nuiqsut households indicate that the percentage of households using roads decreases somewhat with distance from the community, or in areas with high concentrations of drill sites. For example, while 52% of households reported using the Spur Road extending north from the community in 2018, 40% reported using the road between CD5 and GMT-1, and only 10% reported using roads crossing east of the Niġliq Channel toward the CD1 and CD4 developments (Willow MDP Final EIS Section 3.16). Data are not available at this time to determine why road use declines with distance from the community, but reasons could include lack of time (residents report using roads due to the ease of access during times when they are unable to take longer trip), lack of money or fuel to take longer trips, or successful harvests closer to the community. Decreased use of roads to the east of Niġliq Channel could be due to a relatively lower abundance of resources in that area, or due to heightened concerns about safety due to the greater concentration of infrastructure and human activity. Thus, because of the greater distance of Project roads from the community and the relatively higher density of infield roads and drill pads (compared to the GMT and Alpine developments), particularly near the junction of the access and infield roads where the airstrip, WPF, and WOC would be located, use of Project roads may be somewhat lower than other industry roads closer to Nuiqsut. Once Project roads and infrastructure are complete, they may introduce additional concerns for residents hunting along existing roads, particularly between GMT-1 and GMT-2, as there would be fewer directions in which to shoot without consideration of human safety.

Roads would act as a physical impediment to those traveling overland, or to those traveling on or off roads to access use areas. Tundra access ramps and road pullouts at regular distances would reduce issues with off-road travel. However, some Nuiqsut hunters report difficulty crossing onto or over existing roads, even using existing tundra access ramps, particularly when hauling a heavy sled (SRB&A 2018a). Recent upgrades to these ramps, consisting of a more gradual slope, ramps on both sides of the road, and the inclusion of a landing area at the top of each ramp, should increase the usability and safety of the ramps. While tundra access ramps would reduce impacts to access, residents may have to travel extra distances to access crossing areas if they are traversing overland. Ice roads would not include tundra access ramps but would likely have a smaller slope that would pose less of a barrier to travel; however, crossing over ice roads may be difficult due to high traffic volumes and restricted access along certain routes. The mine pits, which would be located on either side of the highly used Ublutuoch (Tiŋmiaqsiuġvik) River drainage, would also act as a physical barrier to harvesters traveling overland; residents traveling by snow machine or ATV would have to divert around the mine site during construction and in subsequent summers when the mine would fill with water. Pipelines would be placed a minimum of 7 feet above the surrounding ground surface and would generally be high enough for harvesters to cross underneath on snow machines or ATVs, although large snow drifts may result in harvesters detouring to areas with increased clearance.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The Naval Petroleum Reserves Production Act of 1976, as amended, instructs the Secretary of the Interior to conduct oil and gas leasing in the NPR-A. Congress authorized petroleum production in 1980 and directed the Secretary of the Interior to undertake a program of competitive leasing of potential oil and gas tracts in the Reserve. In 2012, the NPR-A IAP/EIS analyzed impacts of future development in and around the Alpine development, including potential development in the BTU. In 2018, BLM completed

an analysis of the potential impacts of development of the GMT-2 site, including a road connecting the GMT-2 site to the existing GMT-1 site located to the northwest of Nuiqsut. The Section 810 analysis for the GMT-2 project also considered development of the BTU in its Evaluation and Findings for the Cumulative Case. The purpose of the Willow MDP EIS is to analyze impacts specific to the Willow MDP alternatives to aid in differentiation of impacts between the alternatives and to provide information to agencies and other stakeholders so that they can make informed decisions regarding the Project's development. The Project was designed to develop oil from a delineated reservoir on valid leases within the NPR-A. Other lands managed by BLM are too distant to access the BTU reservoir using current drilling technologies.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

Alternative A (No Action) would reduce or eliminate the use of public lands needed for subsistence purposes. However, BLM may not select Alternative A as its preferred alternative. BLM issued leases to CPAI and is required to allow reasonable development of those leases. The Willow MDP Final EIS Appendix D, Section 3.1.3, *Alternative Components Considered but Eliminated from Further Analysis*, discusses other alternatives (or alternative components) that were considered but eliminated from detailed analysis due to economic, or technological feasibility or practicability, or because they did not meet the purpose of the proposed action to produce the oil discovered on CPAI's leases.

d. Findings

1. Reductions in the availability of subsistence resources described above for Alternative B may significantly restrict subsistence uses for the community of Nuiqsut.

2. Limitations on subsistence user access described above for Alternative B may significantly restrict subsistence uses for the community of Nuiqsut.

This evaluation concludes that development of Willow MDP EIS Alternative B (Proponent's Project) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative B

The Project is likely to deflect TCH caribou from areas where Nuiqsut hunters harvest them. Caribou are a resource of major importance for Nuiqsut. The majority of caribou hunting in the Project area occurs in the eastern portion of the area surrounding the proposed gravel mine site and access road. Caribou would have to cross through the Project area before being hunted in overland areas west of the community and along the Niġliq Channel and Colville River. Deflection would likely occur due to reduced habitat, roads, road traffic, aircraft traffic (overhead flights and take offs and landings), construction noise (including mining activity), drilling noise, and general human activity.

Project roads have a high potential to disturb TCH caribou. Under Alternative B, the gravel access road would bisect the fall migration corridor for a portion of the herd and would be located in an area heavily used by TCH caribou in some years, both summer and winter. According to Nuiqsut residents, roads pose both physical and visual barriers to caribou and it has been observed that changes in caribou distribution and behavior around roads results in decreased availability of caribou closer to the community. Additionally, when caribou are near roads and pads, the availability of these animals is diminished due to safety considerations as residents do not shoot toward infrastructure or areas of human activity.

Impacts related to roads, and roads collocated with pipelines, would extend beyond the Project area. Although caribou are highly mobile during mosquito and oestrid fly seasons, deflected movements and delays are more common where roads and pipelines are close to one another. Project development would result in a second set of pipelines alongside existing pipelines from the GMT-2 drill site to the Alpine development. Deflected movement and delays would also be more common when traffic rates reach and exceed 15 vehicles per hour. Project development would also increase road traffic along existing roads connecting the Project area to the existing GMT-1, CD5, and Alpine developments. These traffic rates would be more common during construction, but it is likely that caribou deflections would continue at a lower intensity during the operations phase.

The Alternative B access road would create a pinch point where it intersects with infield roads, which could deflect some caribou away from the road during the fall migration. What could be small changes in caribou distribution from a biological perspective could have large impacts on hunter success because hunters are generally limited in how far and how fast they can travel, particularly during the snow-free season. Impacts on the availability of TCH caribou would most likely occur during the summer and fall months, when caribou hunting in overland areas and along the Colville River is highest. Deflections or delays of several hours could have substantial impacts to harvesting success for residents hunting east of the road corridor, and particularly to hunters waiting along river corridors.

The location of the proposed gravel mine site could be particularly disruptive to both caribou and hunters. The site is directly west of Nuiqsut in an area commonly reached by hunters traveling overland. Although blasting and excavation would occur during winter when caribou hunting levels are lower, Nuiqsut hunters do harvest caribou in the area in winter and the presence of the mine could deflect caribou movement year-round, resulting in localized distribution changes. The mine site would fill with water after construction and thus would no longer provide habitat for caribou; the mine site would remain as a pond(s) directly overlapping an overland hunting trail that heads west from Nuiqsut.

Air traffic could cause direct and indirect disturbance to caribou availability both within and outside of the Project area. In addition to helicopter traffic throughout the analysis area, the Project would include a new airport with large fixed-wing aircraft taking off and landing directly west of Ocean Point, a common hunting area along the Colville River. Increased air traffic associated with the Project would likely affect hunting activities along the Niġliq Channel and the Colville River, upriver toward Ocean Point and in overland areas west of Nuiqsut. The increase in overall regional air traffic associated with the Project would increase the frequency of disturbances experienced by hunters. This type of disturbance would most likely occur during summer and fall when caribou would migrate in an easterly direction through the Project area into areas heavily used by Nuiqsut hunters.

Project activities, particularly during construction, would reduce the availability of furbearers in the vicinity. The Project area has been reported as being used by 88% of wolverine harvesters and 87% of wolf harvesters. The highest overlapping use areas for wolf and wolverine occur around BT1, BT2, BT3, and BT5; low to moderate use occurs around BT4. Impacts to furbearers would be highest in winter when pile driving, mine site blasting and excavation, and ice road operations would occur. These activities would displace furbearers. Residents would likely use other areas where furbearers would be more available, but hunters would likely have to travel farther with greater expense, effort, and risk, because the area west of the community is commonly used and easily accessible. While furbearers generally are not a food source for the community, furbearer hunting and trapping is a specialized activity with unique importance to Nuiqsut.

BLM anticipates that altered distributions of the TCH caribou and furbearers would occur during construction and operation of the Project. As described above, this altered distribution could have large impacts to hunter success due to how far and fast hunters can travel and because there would be deflections or delays in caribou movement for residents to the east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters.

2. Rationale for Finding of Limitations on Subsistence User Access Under Alternative B

A portion of traditional harvest areas would be inaccessible to residents during all Project phases, including land permanently overlain by infrastructure. Much of the Project area would be legally accessible, but infrastructure may act as a physical barrier or obstruction to harvester access. Subsistence users would be prohibited from discharging firearms within safety areas (1,000-foot radii surrounding oil and gas exploration, development, and transportation facilities other than roads) (CPAI 2019a, 2019b). Security protocols prohibit shooting toward infrastructure, people, work crews, equipment, and pipelines. The presence of humans and infrastructure would affect subsistence harvesting patterns in and around the Project area due to safety concerns, rendering some areas unusable for subsistence purposes (the range common to hunting with rifles is 0.5 to 3 miles).

Ice roads used for gravel hauling would be off limits for any other use. These roads would only be present during winter construction, which is not a primary caribou hunting period. However, residents do traditionally harvest caribou in winter along overland areas on the west side of Nuiqsut, particularly in February and March, to supplement their diet.

Access to the gravel mine area may be restricted during the construction phase. The mine site would be a physical barrier to harvesters traveling overland either by snow machine in winter or ATV in summer and fall. After construction, the mine site would be allowed to fill with water, and this would make the area inaccessible for overland travel in summer and fall.

Residents may use non-gravel haul ice roads and permanent gravel roads, once completed, to access subsistence areas. This facilitated access might provide a countervailing effect; however, use of roads declines with distance from the community. The use of Project roads may be lower than the use of roads closer to Nuiqsut (e.g., CD5, GMT-1) due to both the greater distance of Project roads from the community and the relatively high density of Project infield roads and drill sites. Industry road use is subject to standard safety rules, some of which would restrict use for some residents (e.g., no unaccompanied minors). During road construction, residents would not be able to use gravel roads and it may be difficult or impossible to cross them. Once road construction is completed, roads could be a physical impediment to overland travel; gravel roads may also prove to be difficult to gain access to or depart from to access subsistence use areas. Some Nuiqsut hunters have reported difficulty crossing existing gravel roads, even when using specifically constructed tundra/subsistence access ramps, particularly when hauling a heavy sled and in early spring when areas around roads and ramps thaw earlier than the surrounding tundra. Crossing ice roads may be restricted due to heavy traffic and other roads may have periods of overall restricted access.

The totality of limitations on subsistence access associated with the Project, particularly during the 7-year construction phase but lasting through the life of the Project, would constitute a substantial restriction on subsistence access for Nuiqsut residents.

None of these impacts is expected to affect all subsistence hunters equally, and many of these impacts are uncertain. Caribou movement is highly variable; over time, some caribou may tolerate certain sources of disturbance (Willow MDP Final EIS Section 3.12.2.3.2, *Disturbance or Displacement*), and harvesters may adapt to changes in resource availability to some extent. However, given the importance of caribou availability and access to traditional hunting areas to Nuiqsut hunters, BLM expects that limitations to subsistence access and the reduced resource availability anticipated to occur over the 30-year Project life, directly and indirectly attributable to Project development, would result in an extensive interference with Nuiqsut hunter access.

BLM guidance on ANILCA implementation includes relevant direction to an evaluation of subsistence impacts for the Community of Nuiqsut:

> *[T]he determination of significance must be made on a reasonable basis, since it must be decided in light of the total subsistence lands and resources that are available to individuals in surrounding areas living in a subsistence lifestyle.* (BLM Instruction Memorandum No. AK-2011-008, Appendix 6)

Nuiqsut residents have experienced limited access to their traditional subsistence lands and resources in large areas to the east, north, and west due to previous oil and gas infrastructure development, and they currently face substantial increasing development in those areas. As a result, their subsistence use areas have shifted away from developed areas. These impacts affect the relative value of remaining undeveloped land, including land that would be overlain by Project infrastructure and lands adjacent to the Project where subsistence value would decrease to Project development.

3. Evaluation and Finding for Alternative C (Disconnected Infield Roads)

The footprint for Alternative C (Disconnected Infield Roads) is similar to that of Alternative B (Proponent's Project), except there would be no gravel road between the WPF and BT1/BT2/BT4, and therefore no road and bridge crossing Judy (Iqalliqpik) Creek. This alternative would eliminate the perpendicular intersection of the access and infield roads included under Alternative B. Alternative C would also locate the WPF, WOC, and primary Project airstrip (south airstrip) approximately 1 mile to the northeast compared to Alternative B, somewhat closer to the community of Nuiqsut but into areas of lower TCH density. Only one of the three subsistence use boat ramps proposed under Alternative B (the boat ramp accessing the Ublutuoch [Tiŋmiaqsiuġvik] River) would be constructed under Alternative C due to the lack of a gravel road connection to Judy (Iqalliqpik) Creek and upper Fish (Uvlutuuq) Creek.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of Alternative C on subsistence would be similar to those described for Alternative B with two important differences:

1. Alternative C would reduce impacts to migrating caribou resulting from the elimination of the roadway "pinch point" between BT1 and the WPF and the relocation of the airstrip, WOC, and WPF into areas of lower TCH density.
2. Alternative C would increase the frequency and geographic extents of air traffic due to the need for additional air travel during the ice-free months and the addition of a second airstrip (north airstrip).
3. Alternative C would not include subsistence boat ramps on the upper Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks.

Overall, Alternative C would require slightly higher levels of fixed-wing aircraft, helicopter, and ground traffic. However, ground traffic would be more concentrated in the winter months when caribou hunting activity is lower. The lack of a perpendicular road between the WPF and BT1 would decrease the potential for deflection of migrating caribou. The lack of access to the BT1/BT2/BT4 road corridor during the peak caribou hunting season would reduce ground traffic and hunting activity in that area, likely reducing deflection away from the access road and allowing caribou to move more freely along the Judy (Kayyaaq) Creek drainage. If the Project results in large-scale deflections of caribou despite the decrease in infield roads, hunters would have no summer or fall access to the BT1, BT2, and BT4 roads, nor would subsistence boat ramps on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks be constructed to mitigate effects by providing access to areas with heavier concentrations of caribou. Similar to Alternative B, Alternative C would construct a subsistence boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River that would be more easily accessible from the community and that could provide access to key hunting areas on the lower portion of Fish (Iqalliqpik) Creek. Because the south airstrip, WOC, and WPF would be moved slightly farther east into areas of lower caribou density, impacts from air traffic may affect fewer caribou overall and could reduce deflection of caribou migrating toward the community's primary hunting area. However, moving the airstrip, WOC, and WPF closer to the community and core hunting areas may increase the frequency of disturbances to hunters related to aircraft takeoffs and landings, in addition to increased human activity. The increase in air traffic would be likely be offset by decreased ground traffic between the WPF and BT4, and lack of gravel infrastructure and associated human activity between the WPF and BT1 during the peak caribou hunting season. The long-term differences in direct impacts between Alternatives B and C are considered minimal because both alternatives would include a year-round access road to the west of Nuiqsut's core caribou hunting grounds. While air traffic would be

substantially higher under Alternative C, impacts to caribou resource availability would likely be reduced under Alternative C due to the reduction in year-round infrastructure and ground traffic during peak hunting seasons.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS Alternative C is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS Alternative C is identical to that provided above in Section B.2.c.

d. Findings

1. **Reductions in the availability of subsistence resources described above for Alternative C may significantly restrict subsistence uses for the community of Nuiqsut.**
2. **Limitations on subsistence user access described above for Alternative C may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that development of Willow MDP EIS Alternative C (Disconnected Infield Roads) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative C

The rationale for the finding of reduced availability of subsistence resources under Alternative C is similar to that for Alternative B with a few distinct differences. Under Alternative C, the location of the WPF is an area with lower caribou densities, thus impacts to caribou from WPF-related traffic, activity, and noise would be somewhat reduced. The lack of subsistence hunter road access to infield roads between BT1 and BT4 may allow caribou to habituate to linear infrastructure more readily and allow caribou to establish a pattern of movement through (gravel) roadless corridor along Judy (Iqalliqpik) Creek. Ground traffic rates on these infield roads would likely be reduced during summer. Although increased air traffic would likely offset this to some degree, the reduced ground traffic may allow caribou to habituate to linear infrastructure. Overall, impacts to the disturbance of caribou under Alternative C could be reduced compared to Alternative B because more caribou may move north of the GMT-2-WPF access road due to the roadless corridor along Judy (Iqalliqpik) Creek. Currently, the majority of caribou hunting occurs in the eastern portion of the Project area near the proposed gravel mine and access road. Once this area is disturbed, the area north of the access road may have more caribou; however, restrictions on shooting toward pipelines would limit the actual availability of caribou hunting in the area.

Overall, despite the potential for reduced disturbance to caribou under Alternative C, BLM expects that altered distributions of TCH caribou and furbearers would occur during the Project's construction and operations phases. This altered distribution could have large impacts to hunter success due to how far and fast hunters can travel and because there would be deflections or delays in caribou movement for residents east of the road corridor and along the Colville River, which is a high subsistence use area. BLM concludes that this would cause a major redistribution of resources that would affect the existing availability of these resources for Nuiqsut hunters.

2. Rationale for the Finding of Limitations on Subsistence User Access Under Alternative C

The rationale for the determination that interference with subsistence access would be extensive under Alternative C is identical to the rationale provided for under Alternative B (Section B.2.d.2) with the

exception that under Alternative C, residents of Nuiqsut would not have all-season road access to the infield roads between BT1 and BT4.

4. Evaluation and Finding for Alternative D (Disconnected Access)

The footprint for Alternative D (Disconnected Access) is similar to that of Alternative B except there would be no gravel access road connection between the Project area and the GMT-2 and Alpine developments. Under this alternative, transportation to the Project area would be exclusively by aircraft for approximately 9 months of the year (May through January) and primarily via ice road for 3 months of the year (February through April). Gravel roads would connect the WPF, which would be colocated with BT3, to the other four drill sites and Project infrastructure. The WPF, WOC, and airstrip would be located approximately 3 to 4 miles southwest of their locations under Alternative B, thus possibly increasing human-related disturbances within areas of higher caribou density. However, overall, this alternative would reduce linear infrastructure on the landscape, remove the intersection of the access and infield road, and reduce year round ground traffic with the goal of reducing impacts to migrating caribou. Similar to Alternative C, only one of the three subsistence use boat ramps proposed under Alternative B (the boat ramp accessing the Ublutuoch [Tiŋmiaqsiuġvik] River) would be constructed under Alternative D due to the lack of a gravel road connection to Judy (Iqalliqpik) Creek and upper Fish (Uvlutuuq) Creek.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of Alternative D on subsistence would be like those described for Alternative B with one important difference: Alternative D would reduce impacts to migrating caribou resulting from the elimination of the gravel access road connecting the Project to the GMT-2 and Alpine developments. Overall, Alternative D would require higher levels of fixed-wing aircraft and helicopter traffic resulting from the lack of year-round road access to the Project. On average, the increase in air traffic would amount to one or two additional fixed-wing aircraft trips per day for the life of the Project (32 years) and one additional helicopter trip per week during the drilling and operations phases; these trips would be more concentrated during the 9 months when there would be no ice road access. The increase in air traffic could result in a greater frequency of air traffic disturbances to caribou, resulting in decreased harvest success for Nuiqsut hunters during individual hunting trips. The lack of a gravel access road running perpendicular to the fall migration route, in addition to the lack of ground traffic in that area throughout the summer and fall, would decrease the potential for deflection of caribou migrating through the Project area in the fall, or disturbance of caribou that occur in the area in the summer. While the WPF, WOC, and airstrip would be located farther west into areas of higher caribou density (therefore increasing the potential for disturbances in those areas), they would be farther from Nuiqsut's core caribou hunting grounds.

The lack of a year-round gravel access road under Alternative D means Nuiqsut residents would not have the benefit of access to the Project area via road for hunting. However, it is unclear how much residents would use the Project road system given its distance from the community and the somewhat higher concentration of drill sites; some evidence shows decreased use of roads with increased distance from the community or in more densely developed areas (Willow MDP Final EIS Section 3.16, *Subsistence and Sociocultural Systems*). Residents would still be able to use the road system to reach GMT-2 and hunt from those roads by ATV or snow machine. In addition, under Alternative D, there would no subsistence boat ramps on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks to mitigate larger-scale deflections of caribou if they continue to occur despite the decrease in road infrastructure. Similar to Alternative B, Alternative D would construct a subsistence boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River that would be more easily accessible from the community and that could provide access to key hunting areas on the lower portion of Fish (Uvlutuuq) Creek.

Per the Willow MDP Final EIS, Alternative D may result in less impacts on caribou availability due to the lack of a year-round access road. While air traffic levels would be somewhat higher, air traffic generally causes localized disturbances whereas roads can cause larger effects on caribou movement and distribution, in addition to changes in caribou hunting patterns. Across the 10 years of the Nuiqsut

Caribou Subsistence Monitoring Project and as development activity has increased in the vicinity of Nuiqsut, reports of air traffic impacts have remained somewhat stable, while reports of impacts related to human-made structures have increased. In addition, avoidance behavior and changes in hunting patterns have been more evident since construction of roads in the area (SRB&A 2019). Thus, it is likely that while the increase in air traffic would contribute to existing impacts to hunters, additional road infrastructure to the west of the community would substantially increase impacts to resource availability and hunter access. By eliminating a large portion of year-round road infrastructure to the west of the community, Alternative D would reduce deflection of caribou as they migrate toward Nuiqsut's core hunting grounds to the west of the community. Additionally, while the Project area would not be road-accessible year-round for Nuiqsut hunters, they would likely still continue to use existing roads and hunt in the area between GMT-2 and the Project area.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS Alternative D is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS Alternative D is identical to that provided above in Section B.2.c.

d. Findings

1. Reductions in the availability of subsistence resources described above for Alternative D may significantly restrict subsistence uses for the community of Nuiqsut.

2. Limitations on subsistence user access described above for Alternative D may significantly restrict subsistence uses for the community of Nuiqsut.

This evaluation concludes that development of Willow MDP EIS Alternative D (Disconnected Access) is not expected to result in a large reduction in the abundance (population level) of caribou or any other subsistence resource. Neither is there any expectation that there will be a major increase in the harvest of caribou by non-subsistence users. Therefore, this finding of "may significantly restrict" is only triggered by two other primary factors that must be considered:

1. Reduction in the availability of resources caused by alteration of their distribution
2. Limitation of access by subsistence harvesters

The rationale for these findings and the determination of significance are summarized below. The rationale for these findings is similar to those described above for Alternative B (Section B.2.d, *Findings*) with key differences summarized below.

1. Rationale for the Finding of Reductions in the Availability of Subsistence Resources Under Alternative D

Alternative D may result in fewer impacts on caribou availability than Alternative B due to the lack of a year-round gravel access road connecting the Project to existing development (e.g., GMT-2, Alpine); however, BLM still anticipates a major redistribution of resources would occur under this alternative. The lack of a gravel-access road alignment being perpendicular to the fall caribou migration and the lack of ground traffic in that area throughout the summer and fall would decrease the potential for deflection of caribou migrating through the area. Higher levels of fixed-wing aircraft and helicopter traffic resulting from the lack of year-round access would overlap with peak caribou hunting months, which could result in a greater frequency of air traffic disturbances to caribou, resulting in decreased harvester success for Nuiqsut hunters during individual hunting trips. The increase in air traffic would likely not be enough to outweigh the benefits of reduced deflection of caribou as they migrate toward Nuiqsut's hunting grounds to the west of the community. While air-traffic volumes would be somewhat higher, air traffic generally causes localized disturbances whereas roads can cause larger effects on caribou movement and distribution.

Many benefits of reduced deflection from the lack of an access road would be offset by the aircraft traffic (including take offs and landings of large fixed-wing aircraft) in addition to the combined effects of a linear pipeline along the route between GMT-2 and the Project, parallel pipeline racks between GMT-2 and Alpine facilities, Project infield roads, drill sites, and the WPF, the location of and activity at the gravel mine site, and other disturbances described above for Alternative B.

2. Rationale for the Finding of Limitations on Subsistence User Access Under Alternative D

The rationale for the determination that interference with subsistence access would be extensive under Alternative D is similar to the rationale provided for Alternative B with the exception that the lack of a year-round access road under Alternative D means that Nuiqsut residents would not have the potential benefit of access to the project area via road vehicle for hunting. It is unclear how much residents would use the Willow MPD road system given its distance from the community and the somewhat higher concentration of drill sites; some evidence shows decreased use of roads with distance from the community or in more densely developed areas (Willow MDP Final EIS Section 3.17). Alternative D would reduce limitations on overland travel but restrict access via roads. Residents would still be able to use the road system to GMT-2 and hunt off of those roads by four-wheeler or snow machine. Limitations to access described above for Alternative B resulting from direct overlap with subsistence use areas, safety areas around sites, road use guidelines, security protocols restricting shooting, and gravel haul ice roads would be similar under Alternative D.

5. Evaluation and Finding for Module Delivery Option 1 (Atigaru Point Module Transfer Island)

Module delivery Option 1 (Atigaru Point Module Transfer Island), would include construction of an MTI near Atigaru Point to support sealift module delivery to the Project. Module delivery by sealift barge to the MTI would occur over two summers; the modules would be stored on the MTI and then transported from the MTI to the WPF via an ice road. Gravel would be hauled from the Tiŋmiaqsiuġvik mine site via ice road to the MTI site for construction. During construction, the MTI would house facilities such as an office, break room, and helipad; a temporary 100-person work camp would be located onshore near Atigaru Point. Construction facilities and supplies would be demobilized once construction was complete.

In the Willow MDP Final EIS, BLM analyzed potential direct impacts on subsistence based on a 2.5-mile buffer of permanent and temporary infrastructure, including the MTIs and associated module transport and gravel haul ice roads, for each module delivery option (module delivery option analysis area). While the MTI-associated activities would occur solely during the construction phase of the Project, the MTIs themselves would remain after module transport was complete. Differences in impacts between the construction and operation phases are discussed qualitatively. The module delivery option analysis areas do not include all areas where development-related activity (e.g., vessel traffic) or impacts would occur. The analysis area allows for more detailed analysis of the area where subsistence users are most likely to experience direct impacts from the Project. Additional direct and indirect impacts that would occur outside the analysis area are also addressed.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The analysis area for module delivery Option 1 (Figure 8) lies within areas heavily used by Nuiqsut residents for subsistence. Between 1995 and 2006, a substantial proportion of Nuiqsut harvesters reported using the analysis area for harvesting of caribou, wolverine, and wolf (over 80% of harvesters each); and goose (over 50% of harvesters). These resources are harvested primarily in overland areas crossed by ice roads, particularly where the gravel haul ice road crosses Fish (Uvlutuuq) Creek and terminates at the mine site (Figures 9 through 12). Between 2008 and 2016, the percentage of caribou harvesters using the analysis area for Option 1 ranged from 33% to 78%; caribou harvests within the area ranged from 4% to 11% of the total harvest during individual study years. Nuiqsut harvesters also use the offshore area in Harrison Bay surrounding the MTI for subsistence harvesting of bearded seal (33% of harvesters), ringed seal (26%), and eider (14%). Uses of the area directly to the east of the analysis area for these resources

are higher (Figure 13). Eleven percent of Utqiaġvik harvesters reported using the Option 1 analysis area, primarily for wolf and wolverine, during the 1997 to 2006 time period (Figure 14). While the bowhead whale hunt is a culturally important subsistence activity and provides a large portion of the Nuiqsut's annual subsistence harvest, the community's whale hunting activities occur a substantial distance east of the potentially affected area, near Cross Island. Thus, impacts to bowhead whale hunting associated with the Project are unlikely.

As discussed in Section B.2.a, both caribou and wolf and wolverine are key resources to the community of Nuiqsut, and the analysis area is heavily used by both caribou and furbearer hunters in Nuiqsut. Other resources of major cultural and/or material importance harvested within the Option 1 analysis area include white-fronted goose and bearded seal (Table E.16.9 in Willow MDP Final EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*). Thus, impacts to subsistence activities related to caribou, wolf, wolverine, goose, and seal are considered in the ANILCA Section 810 evaluation of module delivery Option 1. The analysis area for Option 1 is on the eastern periphery of Utqiaġvik subsistence use areas for wolf and wolverine but is directly east of the Teshekpuk Lake area, which is a key traditional use area for many Utqiaġvik residents and includes areas of moderate to high overlapping subsistence use. Moderate overlapping subsistence use also occurs to the southwest of the Project toward Ikpikpuk River, which is a key subsistence drainage for the community of Utqiaġvik (Willow MDP Final EIS Figure 3.16.4). Caribou are also harvested to the west of the Project; however, the analysis area is on the eastern periphery of the herd's range and is not expected to alter caribou migration routes to the extent that they would affect Utqiaġvik harvesting activities to the west. Thus, the ANILCA Section 810 evaluation for module delivery Option 1 focuses on impacts to furbearer harvesting for Utqiaġvik. As discussed in Section B.2.a, furbearer hunting does not provide substantial amounts in terms of food but is a specialized and culturally important activity that contributes to the local economy.

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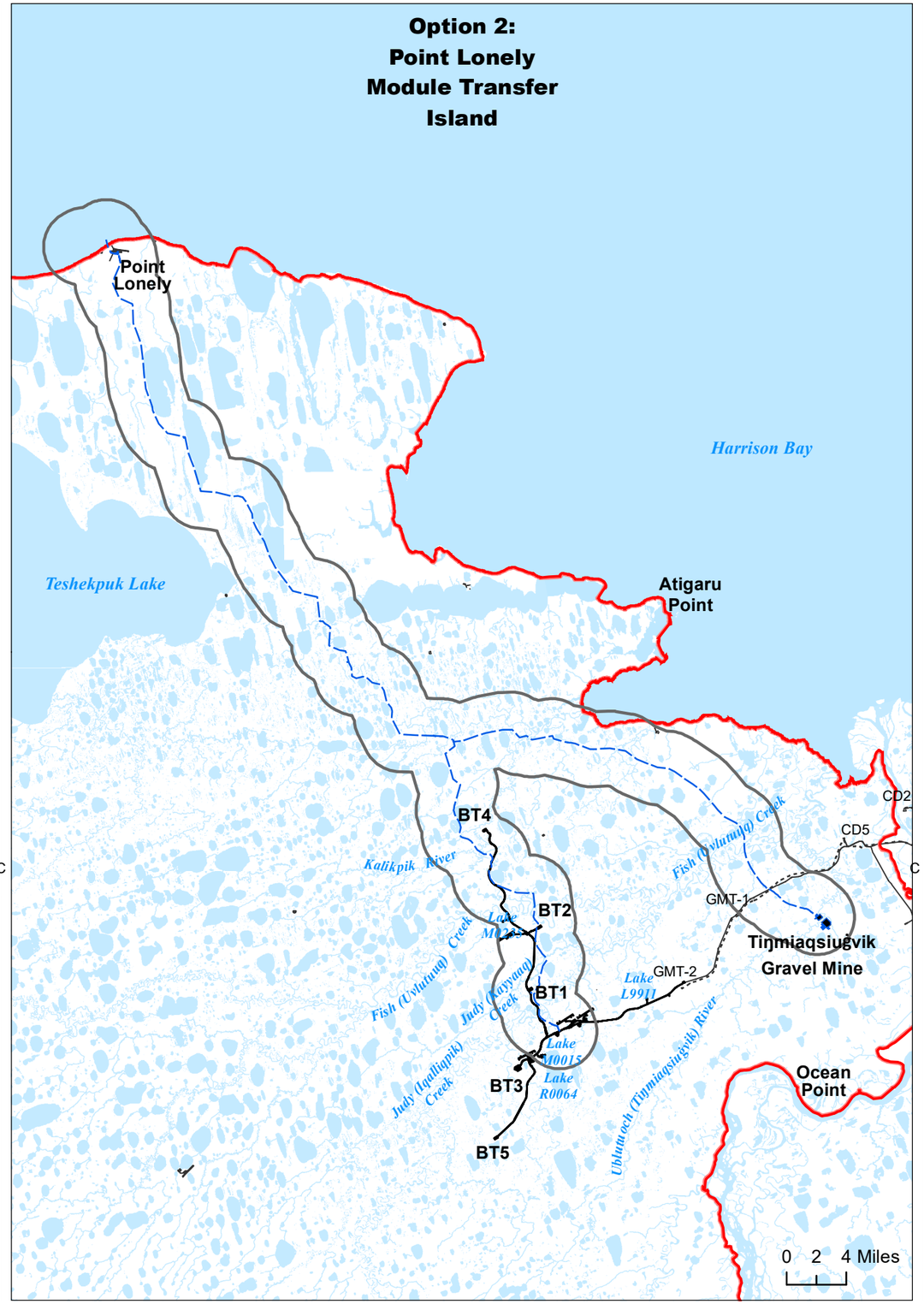
Option 1: Atigaru Point Module Transfer Island

Option 2: Point Lonely Module Transfer Island



Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

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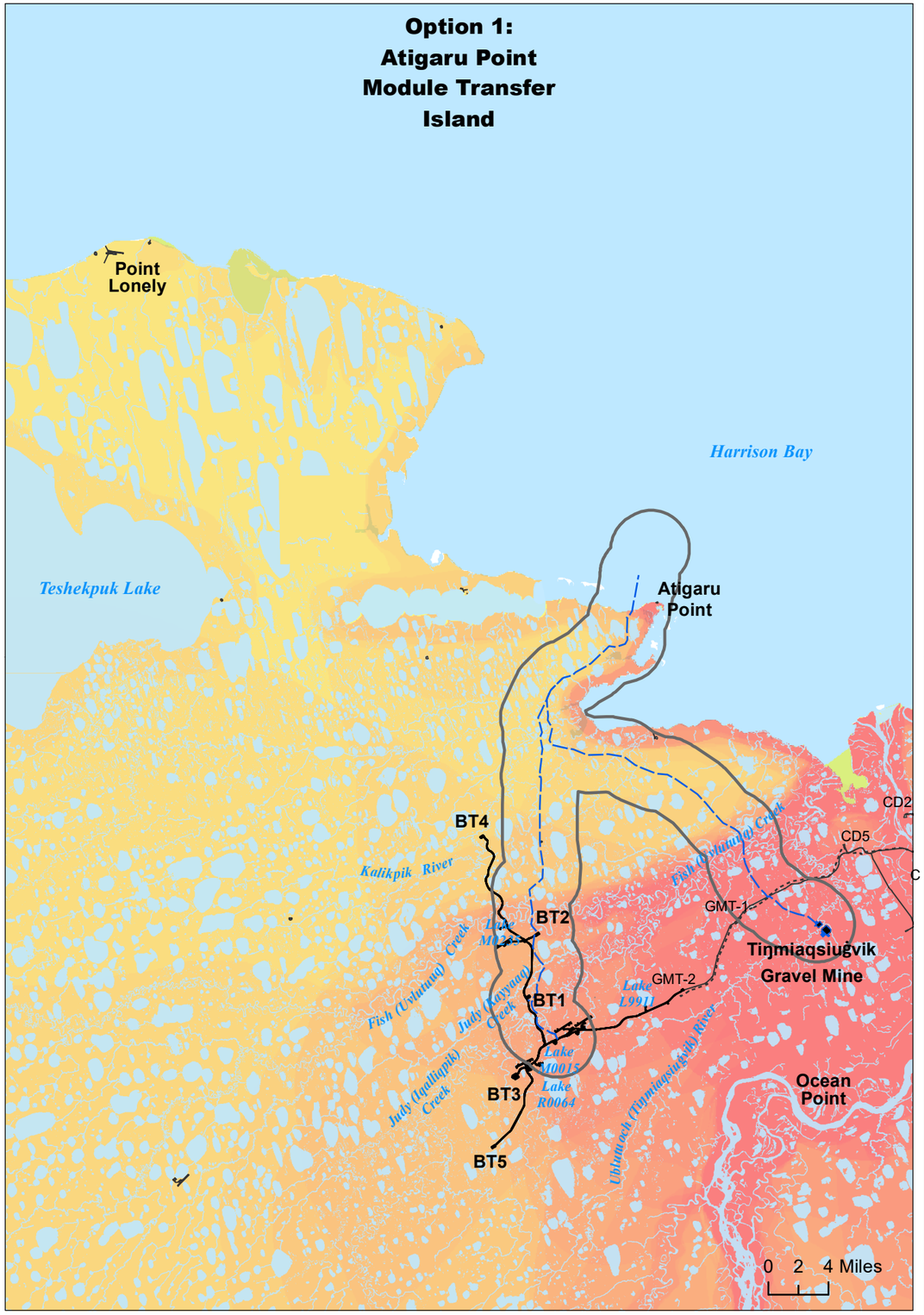
Figure 8



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
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Source
a. SRB&A 2010a

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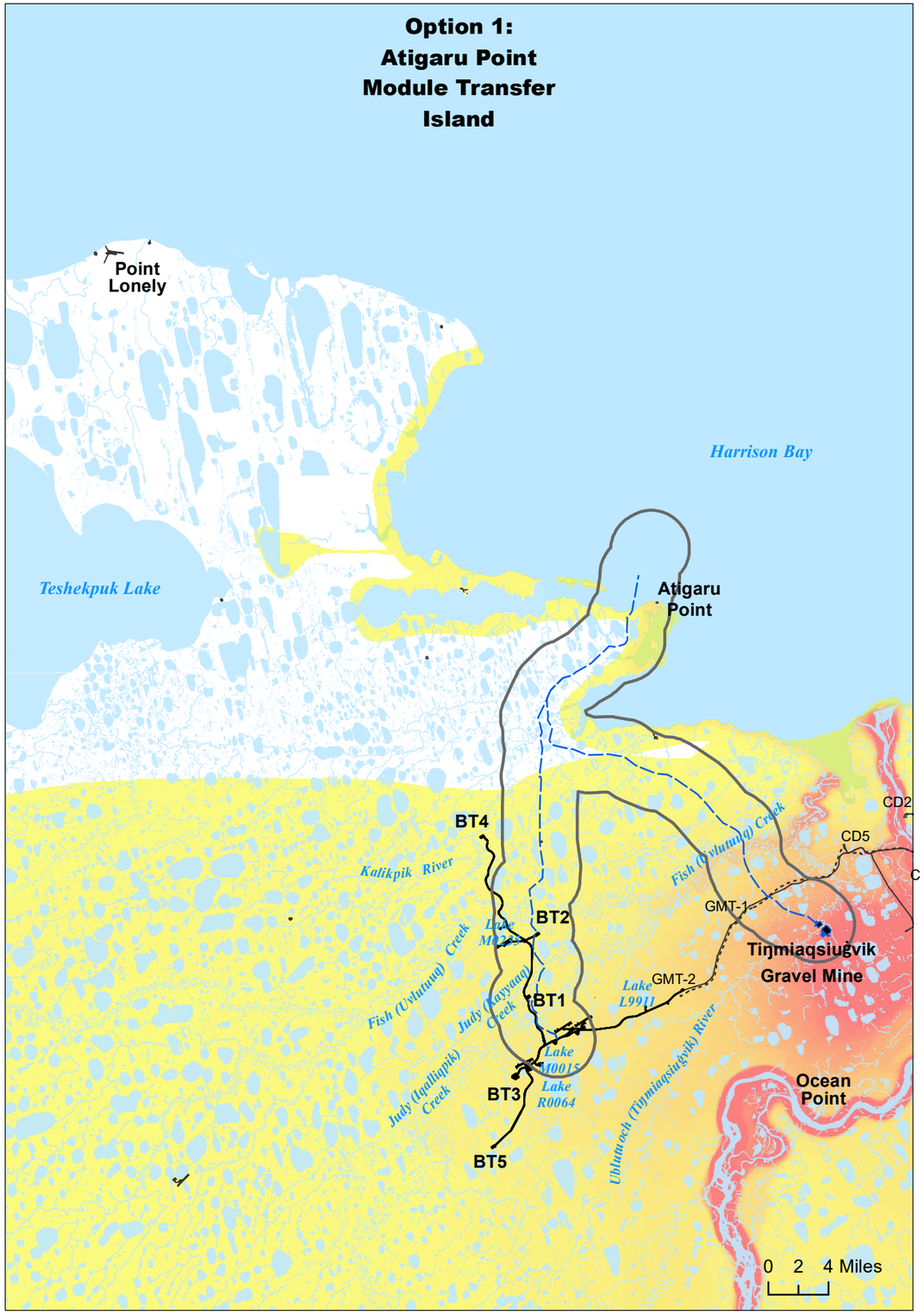
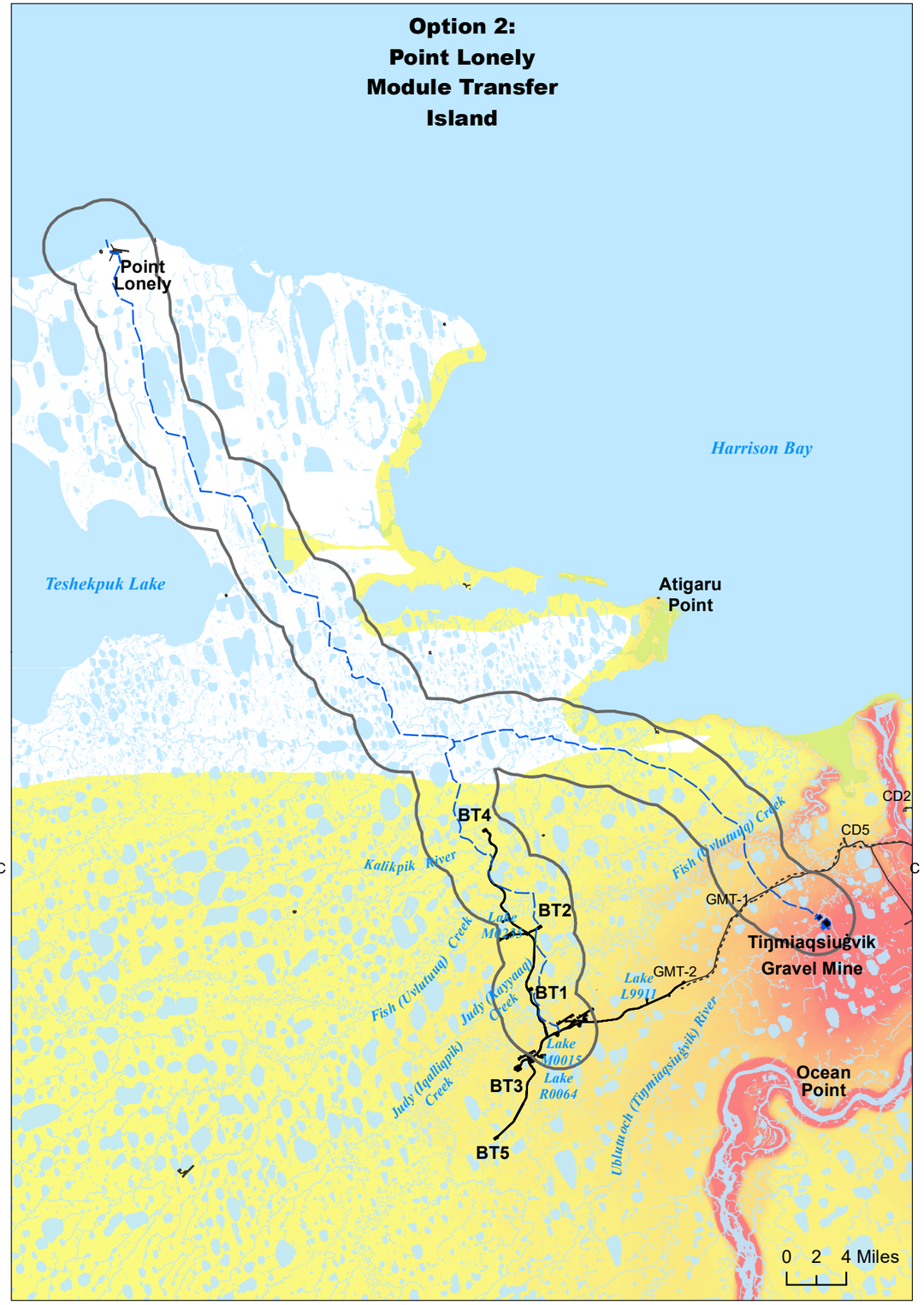
Figure 9





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Caribou, January 2008 through October 2016 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2018

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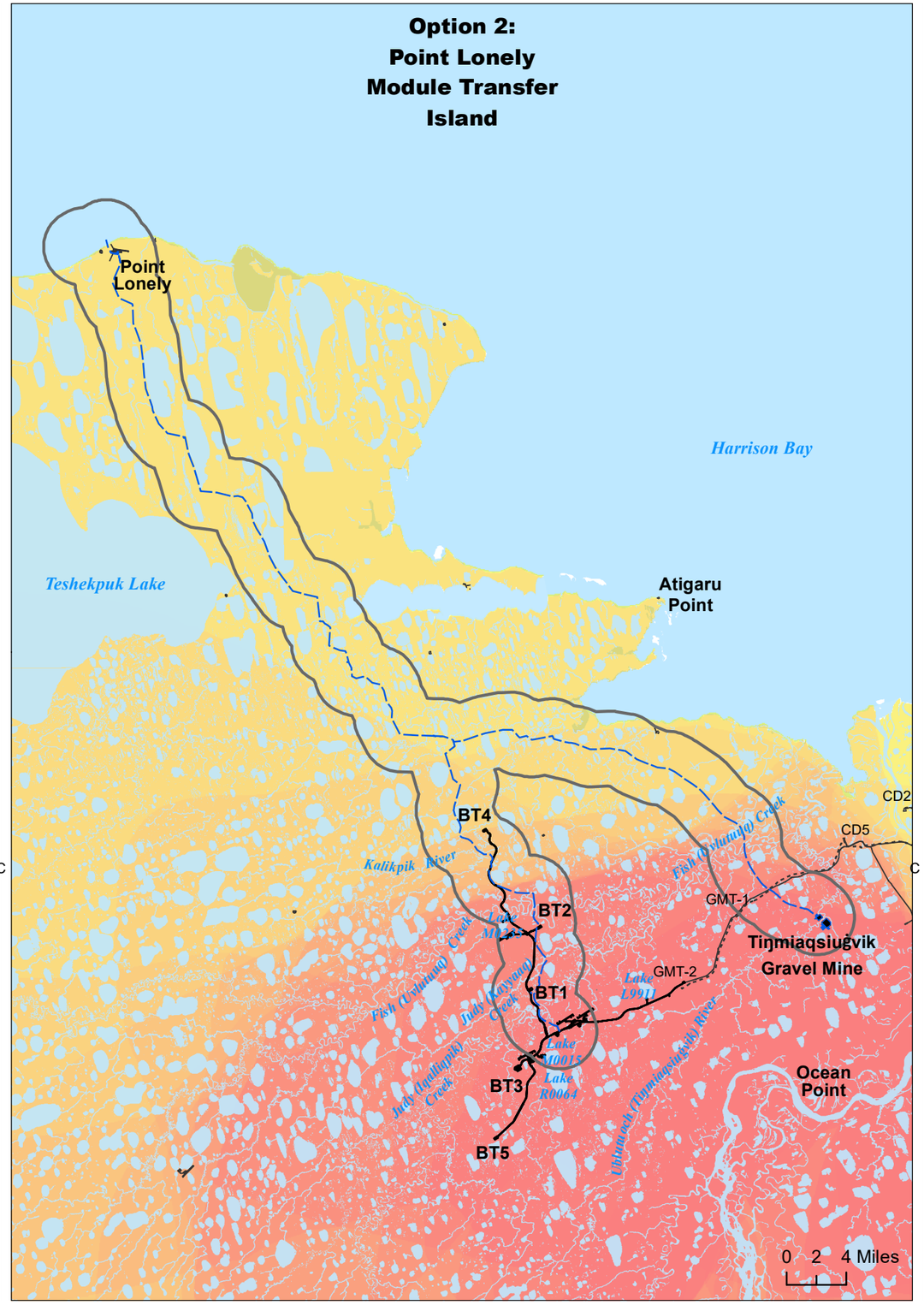
Figure 10

Option 1: Atigaru Point Module Transfer Island

Option 2: Point Lonely Module Transfer Island



Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006[a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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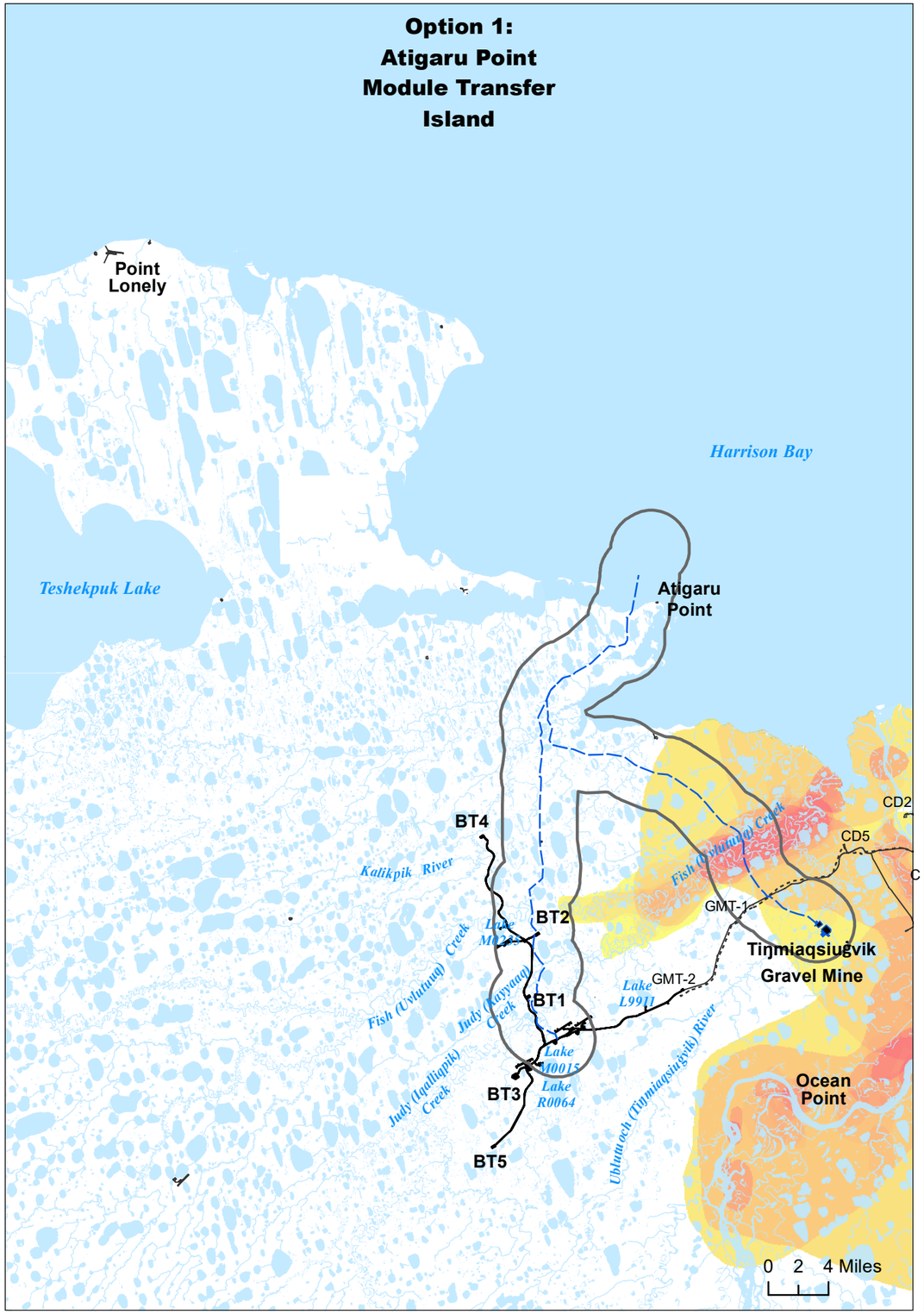
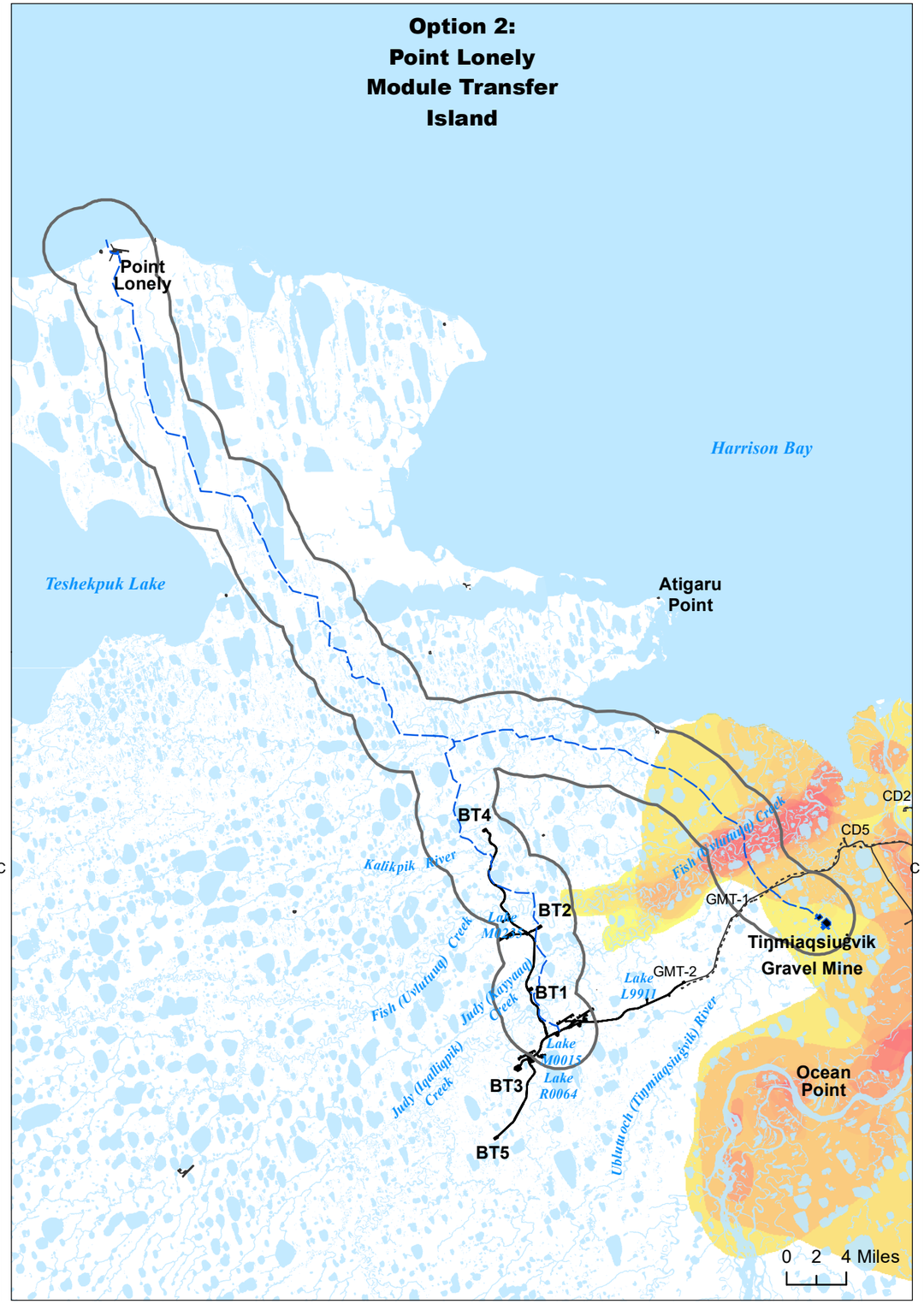
Figure 11

Option 1: Atigaru Point Module Transfer Island



Option 2: Point Lonely Module Transfer Island



Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Goose, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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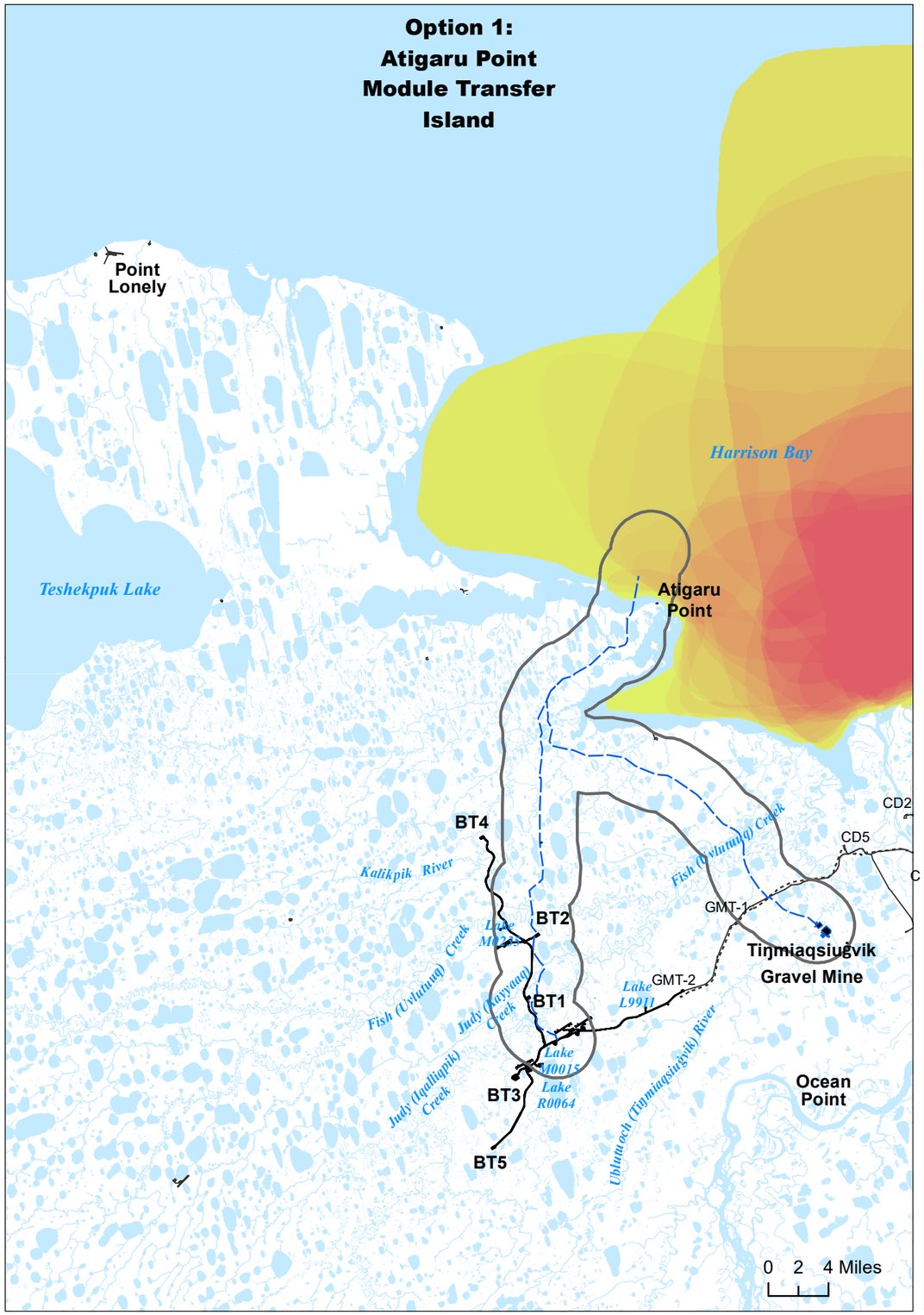
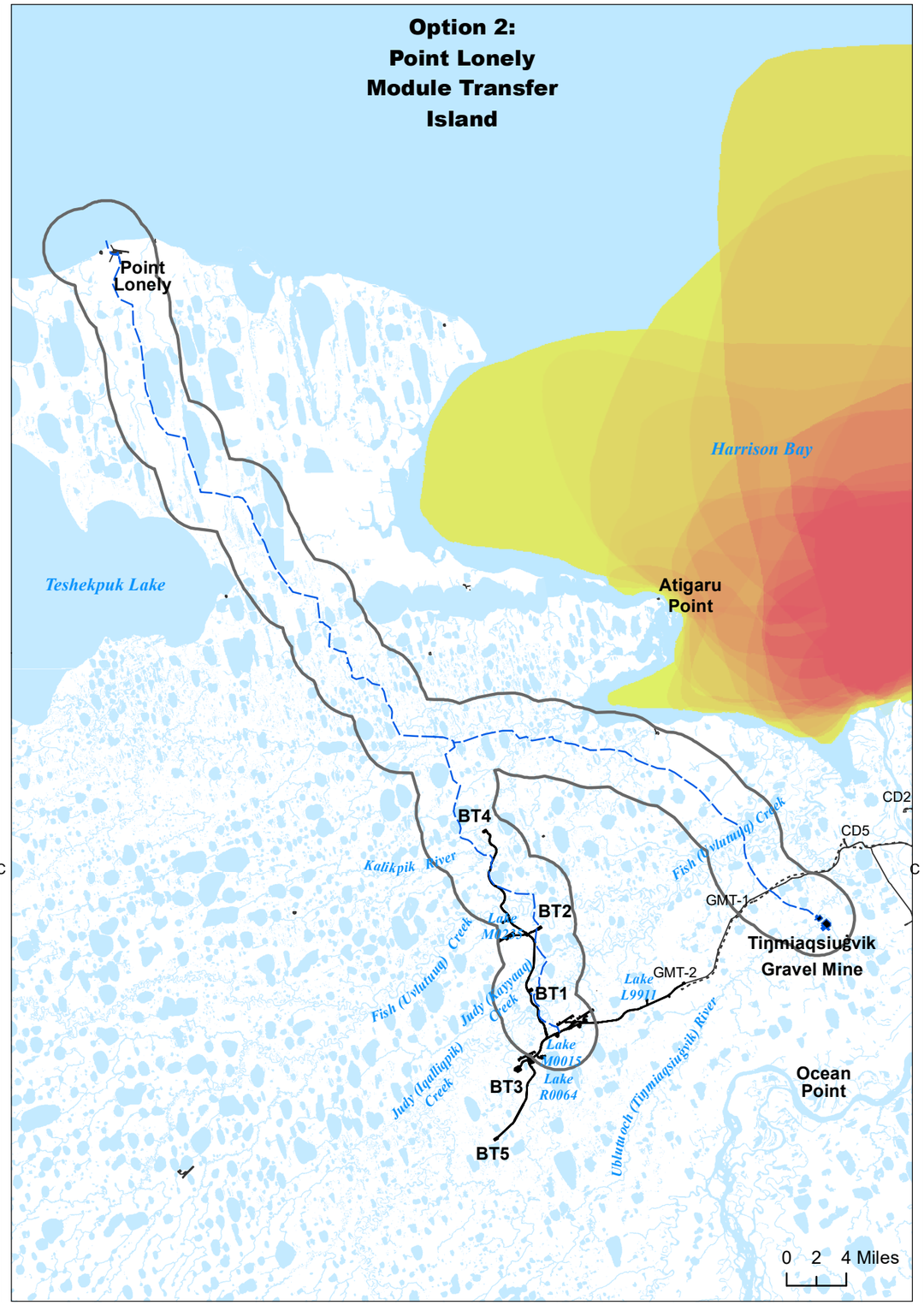
Figure 12





Subsistence Data

High / Low — Overlapping Subsistence Use Areas Bearded and Ringed Seal, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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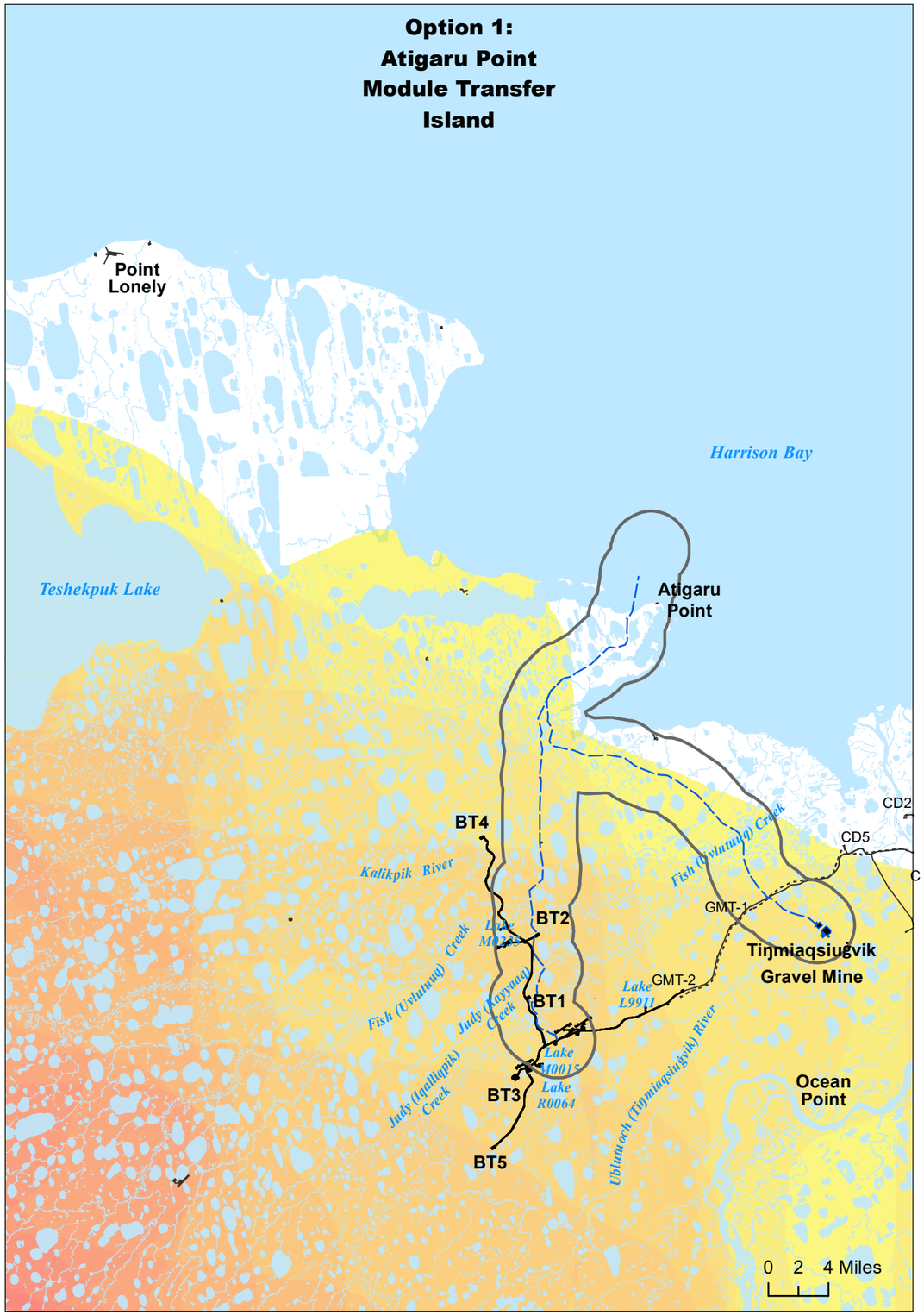
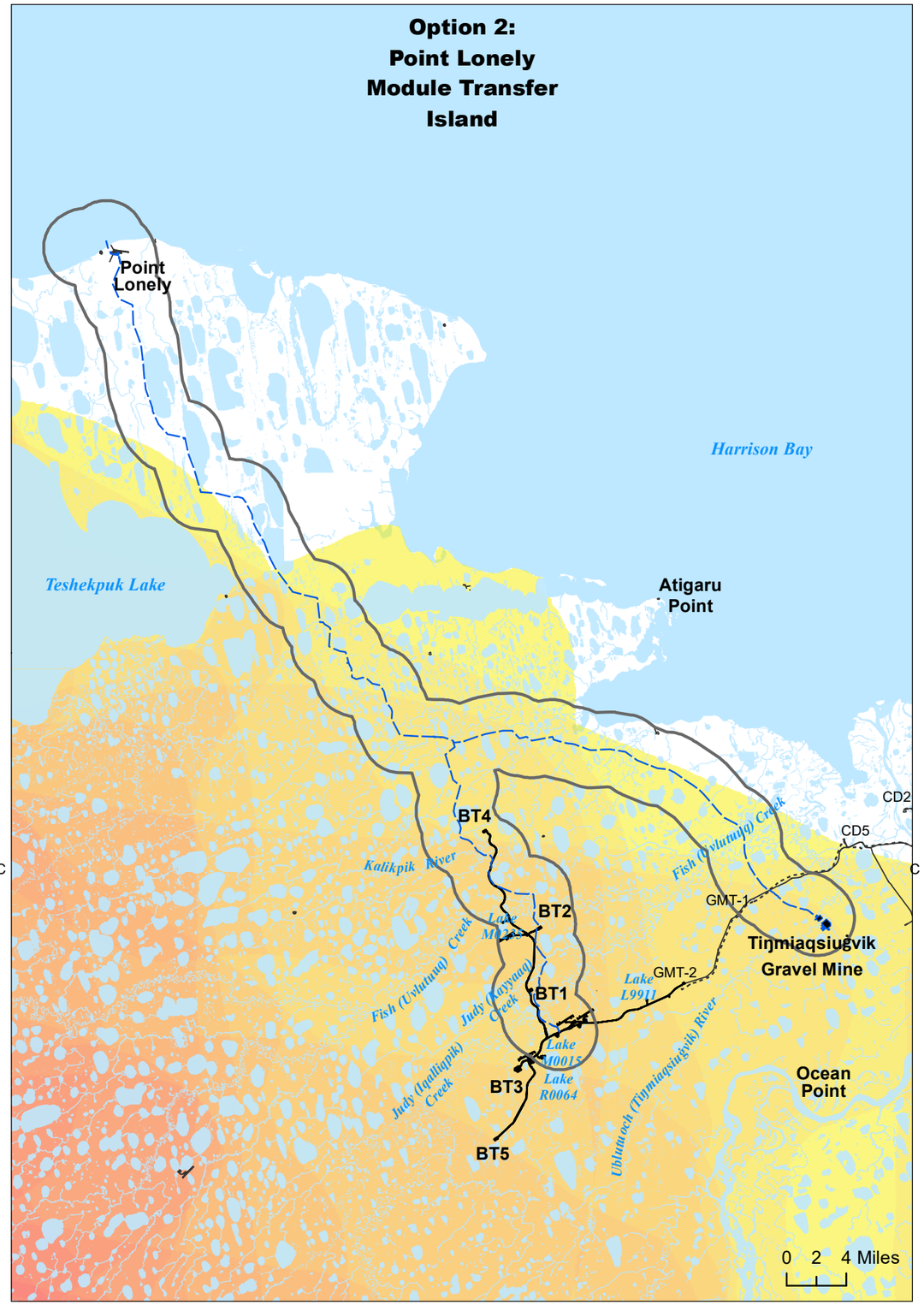
Figure 13





Subsistence Data

- High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1997-2006[a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
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Source
a. SRB&A 2010a

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Figure 14

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Subsistence Resource Abundance

While construction activities associated with the MTI, including ice roads, would result in the temporary removal or disturbance of habitat for some resources and could cause direct mortality to individual animals, these are not expected to have population level effects on subsistence resources. Terrestrial mammals, including caribou, generally do not use sea ice habitat and therefore would not be directly affected by the MTI. Ice roads associated with the MTI occur within the TCH range but would be in an area of relatively low calving density (Willow MDP Final EIS Section 3.12, *Terrestrial Mammals*). Traffic along ice roads, which would exceed 15 vehicles per hour during construction, could result in collisions and direct mortality of individual animals such as caribou. The area is not heavily used by caribou in winter and does not have a high density of wolf or wolverine; thus, the abundance of caribou, wolf, and wolverine available for subsistence use would not be impacted under module delivery Option 1.

While goose habitat occurs throughout the analysis area and could experience degradation or alteration, these changes are not expected to affect overall bird abundance. Individual mortalities could occur as a result of collisions with aircraft, vehicles, and infrastructure, but would not cause population-level effects (Willow MDP Final EIS Section 3.11, *Birds*). Construction of the MTI would result in the direct loss of 12 acres of habitat for seals but is not expected to cause population-level effects to seals (Willow MDP Final EIS Section 3.13, *Marine Mammals*). Fish, particularly broad whitefish, are harvested downstream from the proposed ice road crossing of Fish (Uvlutuuq) Creek. Nuiqsut residents generally do not harvest fish in Harrison Bay, but instead harvest them from river drainages. Water withdrawals for ice infrastructure could alter fish habitat but these alterations would be temporary and are not expected to affect fish populations in Fish (Uvlutuuq) Creek (Willow MDP Final EIS Section 3.10, *Fish*). A large oil spill could have larger population-level effects to resource abundance, but such a spill is not expected to occur in association with the MTI or associated barging or ice road traffic (Willow MDP Final EIS Sections 3.10, 3.11, and 3.13). Thus, the abundance of goose, seal, or fish available for subsistence use would not be impacted under module delivery Option 1.

Subsistence Resource Availability

A description of subsistence uses for Nuiqsut and Utqiaġvik is provided in Willow MDP Final EIS Section 3.16.1, *Affected Environment,* and in Willow MDP Final EIS Appendix E.16, *Subsistence and Sociocultural Systems Technical Appendix*. As noted above, use of the Option 1 analysis area for caribou hunting primarily occurs in the vicinity of ice roads—particularly gravel haul ice roads—associated with the MTI. The gravel haul ice road extending from the Tiŋmiaqsiuġvik mine site to Fish (Uvlutuuq) Creek occurs in areas of high overlapping use for Nuiqsut caribou hunting. Hunting along Fish Creek occurs by boat in the summer months; however, overland travel during the winter and summer months also occurs in the area between the mine site and Fish Creek. Hunting along Fish Creek by boat in the summer continues to be an important subsistence activity but the frequency has decreased in recent years; reasons for the decrease in use include difficulty accessing the mouth of Fish Creek due to increasingly shallow waters in nearshore areas near the mouth of the creek, and the high costs associated with traveling to Fish Creek via Harrison Bay (SRB&A 2019). Subsistence boat ramps constructed as part of the Project may increase use of the Fish (Uvlutuuq) Creek area during the summer months. The overland area toward Fish Creek remains a heavily used area by the community of Nuiqsut during the summer and fall caribou hunting season and is primarily accessed by ATV, although residents increasingly access the area by truck along the road system. When traveling by ATV, residents can generally travel as far west as the Ublutuoch (Tiŋmiaqsiuġvik) River; however, access to the road system also allows residents to haul ATVs and travel farther toward Fish (Uvlutuuq) Creek than previously possible. Residents also hunt in coastal areas of Harrison Bay during the summer, with Atigaru Point being an important traditional hunting area where residents target TCH caribou during the insect relief season. In recent years, use of this area has decreased as a result of increased sedimentation and shallow waters along the coast, in addition to a reported decrease in the availability of caribou in the area (Willow MDP Final EIS Section 3.16) (SRB&A 2018a).

Wolf and wolverine hunting within the Option 1 analysis area, particularly in the southern portions of the gravel haul and module transport ice roads, is similar to that described in Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability, Displacement of Furbearers*), and occurs primarily in the winter months to the west, south, and southeast of the Nuiqsut. Hunting of wolf and wolverine is less common in the northern portion of the Option 1 analysis area (Figure 11). For Utqiaġvik, wolf and wolverine hunting occurs primarily around the module transport ice road but extends throughout the southern portion of the analysis area (Figure 14).

Goose hunting in the Option1 analysis area occurs most commonly in areas where the gravel haul ice road intersects with Fish (Uvlutuuq) Creek but also to the north and east of the Tiŋmiaqsiuġvik gravel mine site. Most goose hunting along Fish Creek and in overland areas occurs by snow machine in the months of April and May (Willow MDP Final EIS Appendix E.16). Seal hunting by Nuiqsut residents occurs throughout Harrison Bay by boat, with moderate overlapping use offshore from Atigaru Point; high overlapping use occurs directly east of Atigaru Point in Harrison Bay. Seal hunting peaks in the months of July and August (Willow MDP Final EIS Appendix E.16).

Noise and traffic associated with the gravel haul and module transport ice roads, and the physical presence of the ice roads themselves, could affect the availability of caribou, wolf, wolverine, and goose for Nuiqsut harvesters, and the availability of wolf and wolverine for Utqiaġvik harvesters. Depending on annual conditions, ice roads may still be present in late April, when goose hunting along Fish (Uvlutuuq) Creek intensifies (Figure E.16.1 in Appendix E.16); thus, goose hunters could experience direct hunting impacts while the gravel haul ice road is operational. This would only occur during a single winter ice road season when gravel haul to the MTI would take place. See Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability*), for a discussion of how roads and associated road traffic may affect the availability of caribou, furbearers, and other resources. Because MTI gravel haul and module transport ice roads would not be present during the fall caribou migration, it is unlikely they would cause overall changes in caribou distribution or migration; however, caribou may be deflected from ice roads in winter during times of heavy road traffic, affecting resource availability for caribou harvesters. Peak ground traffic levels associated with the MTI would reach up to 121 trips per hour in the winter and could have a high potential for disturbance. If ice roads are still in place and operational at the beginning of the waterfowl hunting season in mid-to-late April, residents may experience decreased harvesting success during this time for the single season during which the gravel haul ice road would be operational. Geese may be more easily disturbed or temporarily displaced due to traffic and noise, resulting in residents having greater difficulty hunting them.

Noise and human activity associated with construction of the MTI, which would occur during both the winter and summer seasons, could temporarily displace seals, periodically resulting in reduced harvest success for Nuiqsut seal hunters in the MTI area during the summer months. Vessel traffic between the MTI and Oliktok Point, which would occur throughout the open water season, may also cause temporary and periodic displacement of seals that could temporarily affect harvester success. The Project would require a total of nine sealift barges over the course of two delivery seasons; support vessel traffic would be much higher (an estimated 265 support vessels over the course of three open-water seasons). The presence of the MTI could also affect the distribution of marine mammals within the immediate area of the island (Willow MDP Final EIS Section 3.13, *Marine Mammals*). However, noise and infrastructure related to MTI construction would not be likely to cause overall impacts to resource availability as most displacement would be temporary and localized; other suitable seal habitat would be available nearby, and residents would likely avoid areas where immediate disturbance is likely (e.g., around barges, support vessels, and the MTI during times of high activity) (Willow MDP Final EIS Section 3.13). Noise and human activity at the MTI may also affect the availability of caribou along the coast during the summer; however, as discussed above, use of the coastal area in Harrison Bay has been limited in recent years due to access difficulties. Between 2008 and 2016, the Coastal West area has accounted for between zero and 2% of the total harvest (SRB&A 2018a); thus, disruptions to caribou in this area would not likely affect overall resource availability for the Nuiqsut.

The Project would require additional fixed-wing aircraft and helicopter traffic to support module delivery Option 1. Most of this traffic would occur between Alpine and Willow. Potential impacts to resource availability related to air traffic are discussed in Section B.2.a, *Evaluation of the Effects of Use, Occupancy, or Disposition on Subsistence Uses and Needs* (*Subsistence Resource Availability*).

Access to Subsistence Resources

Potential impacts to harvester access are discussed in Willow MDP Final EIS Section 3.16. Subsistence users would likely be prohibited from accessing the MTI area while it is under construction and operational, and the MTI would likely remain a gravel barrier island after decommissioning. Changes to coastal areas resulting from erosion and sedimentation around Atigaru Point is a key concern voiced by Nuiqsut residents who already have reported difficulty accessing nearshore areas in Harrison Bay in recent years. If construction of the MTI does contribute to the increasingly shallow waters in Harrison Bay, then it could further decrease access to coastal hunting areas. Long-term impacts to access would occur if construction of the MTI results in sedimentation or ocean floor changes that affect access to coastal and nearshore areas; however, the MTI is not expected to cause additional sedimentation or shoaling (Willow MDP Final EIS Section 3.16). Some individuals may use the MTI after it is decommissioned as a stopover point when hunting in Harrison Bay, similar to their use of other islands such as Thetis Island; however, it is unknown how accessible the island would be by boat.

Gravel haul ice roads associated with MTI construction would prohibit local use. Module transport ice roads would be restricted during periods of heavy use but would be available for local use during other times. Thus, some Nuiqsut furbearer, caribou, and goose hunters traveling overland by snow machine would likely experience reduced access during the winter and spring months when crossing through areas with ice roads. The gravel haul ice road between the MTI and the Tiŋmiaqsiuġvik gravel mine site would bisect high overlapping use areas for goose on Fish (Uvlutuuq) Creek. Thus, residents would likely experience reduced access to a portion of their goose hunting areas when ice roads continue to be operational in April. Impacts to access resulting from ice roads would only occur during the construction phase of the Project.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 1 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 1 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 1 (Atigaru Point Module Transfer Island), in combination with any of the action alternatives (B, C, or D) would not result in any additional significant restriction on subsistence uses for communities in or near the Project area.

6. Evaluation and Finding for Module Delivery Option 2 (Point Lonely Module Transfer Island)

Module delivery Option 2 (Point Lonely Module Transfer Island), would locate the MTI at Point Lonely, a substantial distance west of Atigaru Point. Option 2 would also include module transport and gravel haul ice roads, but they would extend from the Tiŋmiaqsiuġvik gravel mine site and WPF to Point Lonely. This alternative would locate the MTI away from Harrison Bay, a key marine hunting area for Nuiqsut.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of module delivery Option 2 on subsistence would be like those described for module delivery Option 1 with three important differences:

1. Option 2 would reduce potential impacts to Nuiqsut marine subsistence uses for seal and coastal caribou hunting activities.
2. Option 2 would increase potential impacts to winter subsistence uses to Utqiaġvik furbearer harvesting and other activities around Teshekpuk Lake.
3. Option 2 would increase the area and likelihood of disturbance for TCH caribou.

For Nuiqsut, impacts related to ice roads would be similar to those described for Option 1, as they would terminate in the same Project area locations (i.e., WPF, mine site), would cross Fish (Uvlutuuq) Creek in a similar area, and would affect similar subsistence uses.

The location of the MTI at Point Lonely would move potential marine impacts out of an area of moderate to high marine subsistence use for Nuiqsut into an area of low to limited use for both Nuiqsut and Utqiaġvik (Willow MDP Final EIS Section 3.16, *Subsistence and Sociocultural Systems*), thus reducing the likelihood of direct impacts on marine subsistence uses for either community. However, the gravel haul and module transport ice roads would extend farther west, along the east side of Teshekpuk Lake, and terminating to the north of Teshekpuk Lake at Point Lonely. Teshekpuk Lake is a traditional hunting ground for Nuiqsut and is still used by Nuiqsut hunters, particularly during the winter, and it is a key contemporary subsistence use area for many Utqiaġvik families and hunters year-round. In addition, the lands surrounding Teshekpuk Lake, including those to the north and east of the lake, are critical calving, post-calving, and insect relief habitats for TCH caribou. Ice roads associated with Option 2 would occur over a larger area, resulting in a greater area of disturbance for TCH caribou. In addition, summer Project activities at Point Lonely and along the ice road route, including construction noise, litter clean up (known locally as stick picking), human presence, and air traffic, which would be somewhat higher under Option 2, could affect caribou during the calving and insect relief seasons. This increased disturbance could result in alterations to caribou distribution closer to Nuiqsut and increased disturbance of calving and migrating caribou.

While module delivery Options 1 and 2 would directly affect a similar percentage of Nuiqsut harvesters overall, Option 2 would affect a greater percentage of Utqiaġvik subsistence harvesters of wolf and wolverine (19%) and caribou (21%). The ice road would occur in areas of low to moderate overlapping use for wolf and wolverine for Utqiaġvik and could affect resource availability of furbearers for hunters in the vicinity of Teshekpuk Lake. However, these impacts would only occur for the length of ice road operations during MTI construction module hauling operations and would cause primarily indirect effects.

Overall, Option 2 would reduce direct impacts to Nuiqsut subsistence uses within Harrison Bay but would increase potential indirect impacts to caribou resource availability for Nuiqsut and Utqiaġvik and direct and indirect impacts to Utqiaġvik wolf and wolverine hunters. Under both options, the impacts would occur during the Project's construction phase. Direct impacts to key subsistence uses would be lower under Option 2 for Nuiqsut due to the decreased impacts to marine and coastal subsistence uses, with a slight increase in potential impacts to caribou availability and a slight increase in impacts to furbearer subsistence uses for Utqiaġvik.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 2 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 2 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 2 (Point Lonely Module Transfer Island), in combination with any of the action alternatives (B, C, or D) would not result in any additional significant restriction of subsistence uses for communities in or near the Project area.

7. Evaluation and Finding for Module Delivery Option 3 (Colville River Crossing)

Module delivery Option 3 (Colville River Crossing), would not construct an MTI, instead relying on existing infrastructure at Oliktok Dock, as described under Alternative B. Similar to Options 1 and 2, Option 3 would include a module transport ice road, which would extend from the existing gravel road at Kuparuk drill site 2P (DS2P) to GMT-2, crossing the Colville River near Ocean Point (Figure 15). Some modifications to the existing Oliktok Road would be required to ensure an adequate turning radii for the module transporters; however, this area is not regularly used by contemporary Nuiqsut subsistence users. Option 3 would not require a separate gravel haul ice road from the mine site. Overall, Option 3 would make greater use of existing infrastructure but would cross through areas of heavy subsistence use to the south and southwest of the community.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

The effects of module delivery Option 3 on subsistence would be like those described for module delivery Option 1 with four important differences:

1. Option 3 would reduce potential impacts to Nuiqsut marine subsistence uses for seal and eider and coastal caribou hunting activities (Figure 16 and Figure 17).
2. Option 3 would have a greater potential for direct impacts to Nuiqsut winter subsistence uses due to placement of the module transport ice road in key subsistence harvesting areas to the south and west of the community.
3. Option 3 would reduce the intensity and frequency of impacts associated with ice road traffic because of the lack of a gravel haul ice road and overall reduction in traffic levels.
4. Option 3 would reduce infrastructure and activity within subsistence harvesting areas for Utqiaġvik, thus minimizing direct impacts to that community.

Unlike Options 1 and 2, Option 3 would not require the construction of a gravel nearshore island and would instead use existing infrastructure at Oliktok Dock. Because Oliktok Dock would be used under all action alternatives, regardless of module delivery option, potential impacts associated with the use of the dock are discussed under Alternatives B, C, and D. The use of existing nearshore infrastructure at Oliktok Dock for module delivery would reduce impacts to marine subsistence uses for Nuiqsut and Utqiaġvik.

For Nuiqsut, the types of impacts related to ice roads would be similar to those described for Option 1 and would terminate in the same Project area locations (i.e., WPF, mine site). However, under Option 3, the ice road would originate from the east, crossing through areas of high winter subsistence use for Nuiqsut near the Colville River to the south, southwest, and west of the community. Construction of the ice road under Option 3 would result in the community of Nuiqsut being completely encircled to the north, west, south, and east by gravel or ice roads for two winter seasons. This encirclement would occur over two winter seasons and would therefore be temporary. In addition, the impacts would be additive to existing infrastructure and traffic impacts along the North Slope Borough's Community Winter Access Trail, which provides access for North Slope residents to the Dalton Highway. While impacts of the Option 3 ice road would be additive to the Community Winter Access Trail, they would also be higher, as residents may be less likely to cross or use these roads due to their association with industrial development. Option 3 would affect a slightly higher percentage of Nuiqsut harvesters, primarily because the ice road crosses through areas of high overlapping use for the community, including along the Itkillik River, the Colville River, and overland to the south and southwest of the community. As noted above, part of the ice road would intersect with the Community Winter Access Trail and therefore impacts would be additive in those areas.

Peak hunting activities in those areas occur in the summer and fall when the ice roads and associated activities would not be present. However, while overall hunting activity is lower in the winter, the area surrounding the Option 3 ice road is used heavily by those who conduct winter hunting of wolf (96% of harvesters) and wolverine (96%) (Figure 18), and caribou (91%). While the area where the ice road crosses the Colville River is heavily used by Nuiqsut moose hunters (94%), these activities occur in the fall when the ice road would not be present. The road would also cross through areas of moderate overlapping use for waterfowl in areas used by 45% of goose harvesters (Figure 19). However, few birds are present in the ice road area during winter (Willow MDP FEIS, Section 3.11) and hunting activity in April is limited (SRB&A 2010b); therefore, impacts are unlikely. The ice road crossing on the Colville River is upstream from key fish harvesting areas on the Niġliq and East channels of the river; however, the crossing is located far enough upstream from the CRD that it would minimize impacts to fish passage. Option 3 would require one less winter ice road season (two winters) compared to Options 1 and 2 (three winters). In addition, substantially less ground traffic would be required under Option 3; therefore, the ice road and associated traffic are less likely to deflect or disturb subsistence resources such as caribou and are less likely to deter subsistence harvesters from crossing.

The ice road would overlap with the periphery of overland subsistence use areas for Utqiaġvik in areas of low overlapping use (Figure 20). In addition, the ice road would overlap with areas of moderate overlap for Utqiaġvik moose hunting; however, these moose hunting activities generally occur in summer or fall, when the ice road would be absent, and therefore impacts would be minimal. Compared to Option 1, Option 3 would affect a similar percentage of harvesters for wolf and wolverine (Figure 21), and a slightly higher percentage of caribou harvesters, in areas of low overlapping use. Impacts under Option 3 would occur for the length of ice road and module hauling operations, which would occur over the course of two winter seasons.

Overall, Option 3 would reduce direct impacts to Nuiqsut and Utqiaġvik coastal and marine subsistence uses. Option 3 could potentially affect a greater percentage of Nuiqsut wolf and wolverine and winter caribou harvesters; however, the frequency and intensity of impacts would be less due to the lack of a gravel haul road and decrease in associated traffic, as well as the reduction in ice road seasons from three to two.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the Willow MDP EIS module delivery Option 3 is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the Willow MDP EIS module delivery Option 3 is identical to that provided above in Section B.2.c.

d. Findings

Module delivery Option 3 (Colville River Crossing), in combination with any of the action alternatives (B, C, or D) would not result in any additional significant restriction of subsistence uses for communities in or near the Project area.

Option 3:
Colville River Crossing

Harrison Bay
Atigaru Point
Oliktok Dock
Kuparuk
CD3
CD2
CD1
CD5
CD4N
Colville River
GMT-1
GMT-2
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
Lake L9911
Itkillik River
Ocean Point
DS2P
BT4
BT2
BT1
BT3
BT5
Kalikpik River
Fish (Uvlutuuq) Creek
Lake M0235
Judy (Iqalliqpik) Creek
Lake M0015
Lake R0064
0
5
10 Miles

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

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Figure 15

Option 3:
Colville River Crossing

Harrison Bay
Atigaru Point
Oliktok Dock
Kuparuk
CD3
CD2
CD1
CD5
CD4N
BT4
BT2
BT1
BT3
BT5
GMT-1
GMT-2
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
Ocean Point
DS2P
Kalikpik River
Fish (Uvlutuuq) Creek
Judy (Iqalliqpik) Creek
Lake M0235
Lake L9911
Lake M0015
Lake R0064
Colville River
Itkillik River
0 5 10 Miles

Subsistence Data
- High / Low: Overlapping Subsistence Use Areas Caribou, 1995-2006 [a]

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 16

Option 3:
Colville River Crossing

Harrison Bay
Atigaru Point
Oliktok Dock
Kuparuk
CD3
CD2
CD1
CD5
CD4N
Colville River
GMT-1
GMT-2
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
Lake L9911
Ocean Point
DS2P
Miluliik River
BT4
BT2
BT1
BT3
BT5
Kalikpik River
Fish (Uvlutuuq) Creek
Lake M0235
Lake M0015
Lake R0064
Judy (Iqalliqpik) Creek
0 5 10 Miles

Subsistence Data
High
Low
Overlapping Subsistence Use Areas Caribou, January 2008 through October 2016 [a]

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2018

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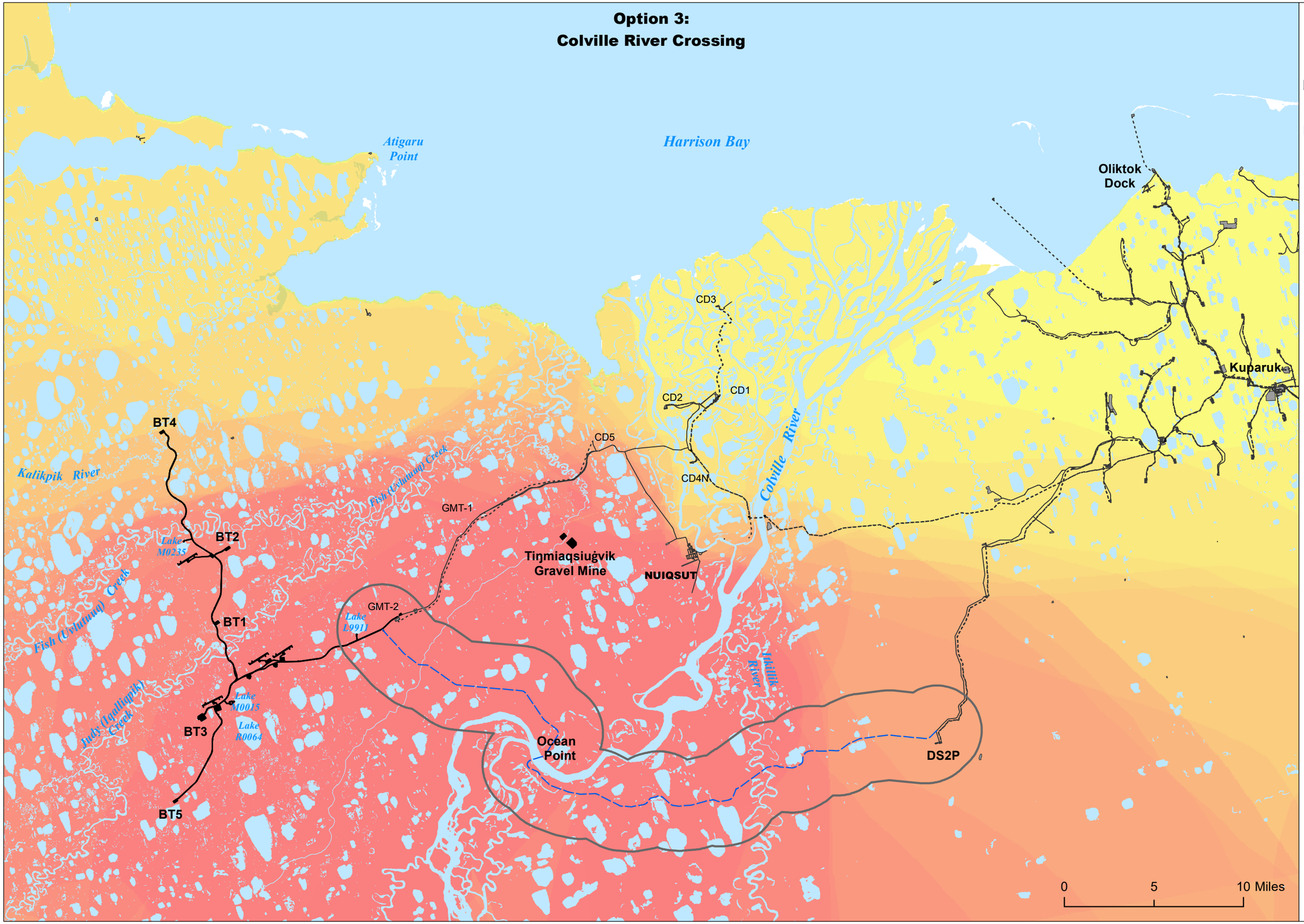
Figure 17



Subsistence Data

High / Low — Overlapping Subsistence Use Areas Wolf and Wolverine, 1995-2006 [a]

Willow Proposed Development Features

- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 18

Option 3:
Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
Kuparuk
CD3
CD2
CD1
CD5
CD4N
Colville River
BT4
BT2
BT1
BT3
BT5
Kalikpik River
Lake M0235
Fish (Uvlutuuq) Creek
Judy (Iqalliqpik) Creek
Lake M0015
Lake R0064
GMT-1
GMT-2
Lake L9911
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
Itkillik River
Ocean Point
DS2P
0
5
10 Miles

Subsistence Data
- High / Low: Overlapping Subsistence Use Areas Geese, 1995-2006 [a]

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 19

Option 3:
Colville River Crossing

Harrison Bay
Atigaru Point
Oliktok Dock
Kuparuk
CD3
CD2
CD1
CD5
CD4N
Colville River
GMT-1
GMT-2
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
Lake L9911
Itkillik River
Ocean Point
DS2P
BT4
BT2
BT1
BT3
BT5
Kalikpik River
Fish (Uvlutuuq) Creek
Lake M0235
Fish (Uvlutuuq) Creek
Judy (Iqalliqpik) Creek
Lake M0015
Lake R0064
0 5 10 Miles

Subsistence Data
- High / Low: Overlapping Subsistence Use Areas Caribou, 1997-2006 [a]

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 20

Option 3:
Colville River Crossing

Atigaru Point
Harrison Bay
Oliktok Dock
Kuparuk
CD3
CD2
CD1
CD5
CD4N
Colville River
BT4
Kalikpik River
Fish (Uvlutuuq) Creek
GMT-1
Lake M0235
BT2
Tiŋmiaqsiuġvik Gravel Mine
NUIQSUT
GMT-2
Lake L9911
BT1
Fish (Uvlutuuq) Creek
Itkillik River
Lake M0015
Judy (Iqalliqpik) Creek
BT3
Lake R0064
Ocean Point
DS2P
BT5
0
5
10 Miles

Subsistence Data
- High / Low: Overlapping Subsistence Use Areas Wolf and Wolverine, 1997-2006 [a]

Willow Proposed Development Features
- Module Transport Analysis Area
- Ice Road
- Ice Pad
- Gravel Footprint

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Map prepared by
Stephen R. Braund & Associates

Source
a. SRB&A 2010a

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Figure 21

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8. Evaluation and Finding for the Cumulative Case

Willow MDP Final EIS Section 3.19, *Cumulative Effects*, contains a description of the cumulative case, which evaluates the impacts of the proposed action in conjunction with past, present, and reasonably foreseeable future actions on subsistence. Reasonably foreseeable future actions considered in the cumulative analysis are provided in Willow Final EIS Section 3.19 and include oil and gas exploration, pipeline and oil field development, and transportation projects. The cumulative impacts of climate change on subsistence are considered as part of the future condition on the North Slope.

Reasonably foreseeable oil development that could contribute to cumulative impacts on subsistence for Nuiqsut, Utqiaġvik, and other North Slope communities include continued development of Kuparuk and Prudhoe Bay, the Nanushuk Development, Nuna DS2, Liberty Development in the Beaufort Sea, federal and state offshore lease sales and development, and the Alaska LNG or Alaska Stand Alone pipelines. In addition, BLM is currently developing an oil and gas leasing program in the Arctic National Wildlife Refuge, which could lead to oil and gas exploration and development in the 1002 (Coastal Plain) area. BLM is also revising the NPR-A integrated activity plan, which could affect oil and gas leasing and development in that area. Other reasonably foreseeable transportation and infrastructure projects include airport and community infrastructure improvements; continued marine vessel and air traffic associated with shipping, development, scientific research, and recreation and tourism activities in the region; and new permanent or seasonal roads including the Colville River Access Road and the Arctic Strategic Transportation and Resources Project, which could lead to development of roads linking North Slope communities to each other and ultimately the Dalton Highway.

BLM's (2020) Final NPR-A IAP/EIS addresses the potential impacts of a no action alternative (Alternative A) and four action alternatives (Alternatives B, C, D, and E), which differ in the areas that would be made available for NPR-A leasing and infrastructure and which would contribute to the cumulative effects of the Project in different ways. While selection of Alternatives A, B, and C of the 2020 Final NPR-A IAP/EIS in the associated ROD would contribute to the cumulative effects of the Project in similar ways, selection of Alternative D or Alternative E would likely result in greater cumulative impacts on subsistence. The potential additional cumulative impacts under the NPR-A IAP/EIS Alternatives D and E are discussed below where relevant.

a. Evaluation of the Effect of Use, Occupancy, or Disposition on Subsistence Uses and Needs

Cumulative effects on subsistence would be similar if Alternatives B or C are selected in the ROD for the Project. If Alternative D is selected, cumulative effects would differ due to the lack of a year-round gravel access road. Construction of the Project without a year-round access road could substantially reduce displacement or deflection of TCH caribou but would result in somewhat higher disturbances related to air traffic and would not provide year-round subsistence access. The module delivery options would not contribute substantially to the cumulative case as most associated activities would occur solely during construction. While Option 1 would have greater overall direct impacts to Nuiqsut marine and coastal subsistence uses, most of these impacts would cease after the construction phase ended.

Regardless of the alternative selected, cumulative oil and gas activity, transportation projects, and climate change will increasingly restrict subsistence uses and affect the availability of subsistence resources such as caribou and marine mammals. This analysis focuses in part on the impacts that would be associated with an access road to the Project (Alternatives B and C) and assumes access roads to any future development west or south of the Willow development in the NPR-A. For the disconnected access road scenario (Alternative D), impacts from access roads as described below would not accumulate from development of the Project, though they may accumulate from other transportation projects in the region. Impacts related to air traffic would accumulate, to a greater degree, under Alternative D because of the slight increase in air traffic required to reach the Project area during the snow-free months.

Since 2000, oil and gas exploration and development has expanded into Nuiqsut's core subsistence use areas, including the CRD (Alpine drill sites CD1 through CD4) and to the north and west of the community toward Fish (Uvlutuuq) Creek (Alpine drill site CD5, GMT-1, and GMT-2). As a result, the frequency of conflicts between subsistence and development activities have increased (SRB&A 2019). The Project, in addition to other reasonably foreseeable future activities such as the Nanushuk development, would contribute to the cumulative effects of development on subsistence resources and activities because it would represent a net increase in the amount of land used for oil and gas and other development, in addition to a related increase in industrial activity, including air traffic.

The Alpine CD5, GMT-1, and GMT-2 development projects are present or presently underway actions that are most closely connected to proposed development in the BTU. These developments were facilitated by previous developments, including Alpine CD5 (for GMT-1) and GMT-1 (for GMT-2). Alpine CD5 was the first major oil and gas development west of the CRD and is connected to Alpine via a bridge and road. Development of BT1 through BT5, particularly in the case of a year-round access road, would likely facilitate future development to the west and southwest of Nuiqsut within the NPR-A. Development of these five drill sites, in combination with existing and future developments, would continue a pattern of development infrastructure surrounding Nuiqsut to the north, west, and southwest of the community. Despite the greater distance from the community, many in Nuiqsut perceive that they are also surrounded to the east by infrastructure associated with the Prudhoe Bay and Kuparuk developments. These areas are now considered off-limits to subsistence uses despite being considered part of the community's traditional use area (SRB&A 2018b). Development of the Nanushuk project would introduce infrastructure directly to the east of the CRD and leave only the southerly direction untouched by oil and gas infrastructure. Despite the lack of infrastructure to the south, oil and gas exploration has occurred to the south of the community and may result in oil and gas development in the future. Finally, development of the BTU would introduce a major oil and gas development within Utqiaġvik's hunting area, although Project development would be located at the eastern edge of the subsistence use area for the community, within an area that provides a minimal amount of subsistence resources compared to land north and west of Teshekpuk Lake. Development of the BTU could lead to additional future development in the BTU and elsewhere in the NPR-A that is within the core harvesting areas for Utqiaġvik and Atqasuk, thus increasing the potential for direct impacts to subsistence users from other communities.

In addition to the additive effects of increasing oil and gas infrastructure in the region, increased activity, including oil and gas exploration and seismic activity, air traffic, vessel traffic, scientific research, recreation, and sport hunting and fishing activities, would also contribute to subsistence impacts by increasing the frequency of noise and air traffic disturbances, vessel disturbances, and interactions with non-local researchers, workers, and recreationists. Increased noise disturbances would contribute to existing impacts on subsistence resource availability. Ongoing disturbances within the NPR-A, in combination with the Project, would likely contribute to changes in the availability of caribou within Nuiqsut's harvesting area. Barges and vessel traffic associated with the Project would occur only during construction and would have relatively minimal impacts on resource availability. However, these activities, in combination with increased and ongoing vessel traffic associated with oil and gas development of offshore leases in the Beaufort and Chukchi seas, could have cumulative impacts on the availability of marine mammals for the North Slope communities of Nuiqsut, Utqiaġvik, Wainwright, and Point Lay. In particular, bowhead whales are a resource of high importance to the coastal communities of the North Slope, and residents could experience reduced harvest success if increased offshore activity causes deflections or behavioral changes in whales.

Development activities and infrastructure can change hunting patterns and use areas over time by introducing barriers, impediments, or restrictions to access; by facilitating access to lesser used hunting areas via roads; or by causing changes to the availability of subsistence resources in the vicinity of development. Nuiqsut's core subsistence use area has shifted west over time due to Prudhoe Bay development, and recent research has documented decreased use of traditional use areas, including the Niġliq Channel, in part due to development activities and infrastructure (SRB&A 2019).

Decreased use areas in some development areas have occurred while road-accessible areas have seen increased use. The Kuukpik Spur Road was constructed in 2014 and 2015 to facilitate access for Nuiqsut hunters to the Alpine development's roads. The road has provided access to residents, and the road system has seen increased use in every year since its construction. Despite the increased use, caribou harvests within the road-connected area, as a percentage of the total reported harvest, have not seen a corresponding increase (Willow MDP Final EIS Section 3.16, *Subsistence and Sociocultural Systems*) (SRB&A 2019). Some hunters indicate that their use of the road system offsets decreased harvests closer to the community, which they believe are a result of deflection from the road itself (SRB&A 2018a). Thus, facilitated access to hunting areas via roads is a countervailing effect that partially mitigates the impacts of roads and associated development on subsistence resource availability; this benefit is particularly prevalent for hunters who are less active, do not have access to other non-road modes of transportation (e.g., snow machines, ATVs), or have limited time to spend harvesting resources. Similar to the Spur Road, the proposed Colville River Access Road would provide increased access to the upriver hunting areas along the Colville River, which could also help to offset impacts resulting from increased development infrastructure to the north and west of the community. Current access to the main channel of the Colville River can be difficult due to shallow river channels. Construction of the Colville River Access Road would be particularly important if the community experiences reduced hunting success to the west of Nuiqsut or in the Niġliq Channel.

Increased development infrastructure on the North Slope would continue to cause alteration and degradation of habitats for key subsistence resources including caribou, furbearers, fish, and goose. Over time, these changes could affect the health and abundance of different subsistence resources on the North Slope. Risks of oil spills and contamination associated with increased development infrastructure and activity could result in increased avoidance of subsistence foods due to concerns about contaminated food sources. This may be more likely to occur with fish resources downstream from potential contamination sites but could also occur with terrestrial mammals, marine mammals, and bird resources. Avoidance of subsistence foods could have sociocultural effects by reducing food security and reducing opportunities to engage in the distribution (sharing), processing, and consumption of subsistence foods.

If development continues westward into the core calving area for the TCH, or if it reduces access to key insect relief habitats, then the herd could experience an overall decline in productivity and abundance. Such a scenario could occur if BLM selects Alternative D or Alternative E in the ROD for the 2020 Final NPR-A IAP/EIS. Alternatives D and E would make areas surrounding Teshekpuk Lake available to oil and gas leasing and infrastructure development. Under this scenario, impacts related to the health and abundance of the TCH would likely extend to subsistence users of the herd including Nuiqsut, Utqiaġvik, Anaktuvuk Pass, Atqasuk, and Wainwright.

The cumulative effects of current and future activities related to restrictions on access to traditional areas, changes in hunting patterns, and reduced resource abundance and availability are likely to continue as long as oil and gas exploration and development continues on the North Slope.

b. Evaluation of the Availability of Other Lands for the Purpose Sought to be Achieved

The evaluation of the cumulative case is identical to that provided above in Section B.2.b.

c. Evaluation of Other Alternatives that would Reduce or Eliminate the Use, Occupancy, or Disposition of Public Lands Needed for Subsistence Purposes

The evaluation of the cumulative case is identical to that provided above in Section B.2.c.

d. Findings

1. Reductions in the abundance of caribou described above for the cumulative case and selection of the 2020 Final NPR-A IAP/EIS Alternative D or Alternative E may significantly restrict subsistence uses for the communities of Nuiqsut, Utqiaġvik, Atqasuk, Wainwright, and Anaktuvuk Pass.

2. **Reductions in the availability of subsistence resources described above for the cumulative case may significantly restrict subsistence uses of marine mammals for the communities of Nuiqsut, Utqiaġvik, Wainwright, and Point Lay, and caribou for the community of Nuiqsut.**
3. **Limitations on subsistence user access described above for the cumulative case may significantly restrict subsistence uses for the community of Nuiqsut.**

This evaluation concludes that the cumulative case could significantly restrict subsistence uses based on BLM's three factors for consideration. Therefore, this finding of "may significantly restrict" is only triggered by the following factors that must be considered:

1. Reduction in the abundance of subsistence resources caused by a decline in their population
2. Reduction in the availability of resources caused by alteration of their distribution
3. Limitation of access by subsistence harvesters

1. The Rationale for the Findings of Reduction in the Abundance of Subsistence Resources Under the Cumulative Case

The 2020 Final NPR-A IAP/EIS considers a no action alternative (Alternative A) and four action alternatives (Alternatives B, C, D, and E). Under the cumulative case, IAP/EIS Alternatives A, B, and C are not expected to cause large-scale changes in the abundance of caribou, although they would likely cause displacement of caribou. Under Alternatives D and E, approximately 75% of the calving range of the TCH would be made available for oil and gas leasing and infrastructure development. Depending on the location of development in these areas, Alternatives D and E of the 2020 Final NPR-A IAP/EIS could cause substantial displacement from calving and insect relief habitat, resulting in reduced calf survival and herd productivity. While no quantitative analysis of community harvests exists by herd, Nuiqsut, Utqiaġvik, Atqasuk, Wainwright, and Anaktuvuk Pass all harvest from the TCH, and all of these communities rely heavily on subsistence harvests of caribou. A large decline in the abundance of TCH could significantly restrict subsistence uses of the TCH for these communities.

2. The Rationale for the Findings of Reduction in the Availability of Subsistence Resources Under the Cumulative Case

The GMT-1, GMT-2, and Alpine CD5 development projects are present or are presently underway actions that are most closely connected to the proposed Project in the BTU. Development of the Project, in combination with existing and future developments, would continue a pattern of development infrastructure surrounding Nuiqsut to the north, west, and southwest of the community that alter the traditional distribution of caribou within the Nuiqsut core subsistence use area. Additionally, despite the greater distance from the community, many in Nuiqsut perceive that they are also surrounded to the east by infrastructure associated with the Prudhoe Bay and Kuparuk developments. These areas are now considered off limits to subsistence uses despite being considered part of the community's traditional use area.

The availability of marine mammals, including whales, may also decline under the cumulative case as a result of increased offshore development and associated vessel and other activities in key marine mammals harvesting areas for Nuiqsut, Utqiaġvik, Wainwright, and Point Lay.

BLM concludes that altered distributions of TCH caribou and furbearers that are likely to occur during construction and operation of the Project, together with the existing GMT and Alpine developments and reasonably foreseeable developments within offshore and onshore NPR-A leases (under all 2020 Final NPR-A IAP/EIS alternatives), could cause a major redistribution of resources within the Nuiqsut core subsistence areas that would affect these resources for Nuiqsut hunters.

3. The Rationale for Findings of Limitations on Subsistence User Access Under the Cumulative Case

Nuiqsut's core subsistence use area has shifted west over time due to the development in Prudhoe Bay and recent research has documented decreased use of traditional use areas, including the Niġliq Channel,

in part due to development activities and infrastructure (SRB&A, forthcoming). This shift, together with impacts anticipated to occur from development of the Project (described under Alternatives B, C, and D), BLM expects that limitations to subsistence access and the reduced resource availability attributable to development of the Project, would result in an extensive interference with Nuiqsut hunter access.

C. NOTICE AND HEARING

ANILCA Section 810(a) provides that no "withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected" until the federal agency gives the required notice and holds a hearing in accordance with ANILCA Sections 810(a)(1) and (2). BLM provided notice in the *Federal Register* that it made positive findings pursuant to ANILCA Section 810 that Alternatives B, C, and D and the cumulative case presented in the Willow MDP Draft EIS as supplemented by the Supplement to the Draft EIS (SDEIS), met the "may significantly restrict" threshold. As a result, public hearings were held in the potentially affected communities of Anaktuvuk Pass, Atqasuk, Nuiqsut, Point Lay, Wainwright, and Utqiaġvik in order to solicit public comments from the potentially affected community and subsistence users. Notice of these hearings were provided in the *Federal Register* and by way of the local media, including the Arctic Sounder newspaper, and KBRW, the local Utqiaġvik radio station with coverage to all villages on the North Slope. Meeting dates and times were posted on BLM's website at www.blm.gov/alaska. Public hearings were held in-person following the publication of the Willow MDP Draft EIS and using remote technologies (i.e., Zoom meeting) following the publication of the SDEIS.

D. SUBSISTENCE DETERMINATIONS UNDER THE ANILCA SECTIONS 810(A)(3)(A), (B), AND (C)

ANILCA Section 810(a) provides that no "withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected" until the federal agency makes the three determinations required by ANILCA Sections 810(a)(3)(A), (B), and (C). The three determinations that must be made are:

1. That such a significant restriction of subsistence use is necessary, consistent with sound management principles for the utilization of the public lands.
2. That the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other such disposition.
3. That reasonable steps will be taken to minimize adverse impacts to subsistence uses and resources resulting from such actions.

BLM found that Alternatives B, C, D, and the cumulative case considered in the Willow MDP Final EIS may significantly restrict subsistence uses. Therefore, BLM undertook the notice and hearing procedures required by ANILCA Section 810 (a)(1) and (2) in conjunction with the release of the Willow MDP Draft EIS and the SDEIS in order to solicit public comment from the potentially affected communities and subsistence users.

The determinations below satisfy the requirements of ANILCA Section 810(a)(3)(A), (B), and (C).

1. Significant restriction of subsistence use is necessary, consistent with sound management principles for the utilization of public lands

BLM has prepared the Willow MDP EIS in response to a proposal submitted by the Proponent to construct infrastructure necessary to allow for the production and transportation to market of federal oil and gas resources from the BTU reservoir in the northeast area of the NPR-A, consistent with the Proponent's federal oil and gas lease unit obligations. It was in furtherance of this objective and in accordance with the BLM's responsibilities established in the Naval Petroleum Reserves Production Act (NPRPA) (as amended), Mineral Leasing Act, Federal Land Policy and Management Act (FLPMA), National Environmental Policy Act (NEPA), and ANILCA, as well as various federal responsibilities of

cooperating agencies under other applicable statutes, including the Clean Water Act, that the Willow MDP EIS was undertaken.

BLM considered and balanced a variety of factors in its development of Project alternatives and analysis of proposed Project activities on public lands. Prominent in its considerations were comments received during public scoping and comment periods and hearings that emphasized the importance of protecting caribou movement and migration and reducing the effects of industrial development on subsistence use and the traditional ways of life of the communities of Nuiqsut and Utqiaġvik. After considering a broad range of alternatives, BLM determined that Alternative B (Proponent's Project) combined with Module Delivery Option 3 (Colville River Crossing) best fulfills the purpose and need of the proposed action while also incorporating protective measures and Project features to reduce impacts to important subsistence uses and resources. Under Alternative B, the lease stipulations, along with the BMPs established by the 2012 NPR-A IAP/EIS (BLM 2012) or the ROPs established by the 2020 NPR-A IAP/EIS, that would apply to the alternative would minimize the impact of the proposed action on subsistence uses and resources. The construction of three new subsistence use boat ramps would help mitigate the impact of proposed action on subsistence uses and resources by providing additional access points to important subsistence use areas.

BLM has determined that the significant restrictions that may occur under Alternative B, in combination with Module Delivery Option 3, when considered together with all the possible impacts of the action, including the cumulative case, are necessary and consistent with sound management principles for the use of these public lands and BLM's obligations as established under the statutory directives in the NPRPA, as amended, FLPMA, and other applicable laws.

2. The proposed activity will involve the minimal amount of public lands necessary to accomplish the purpose of such use, occupancy, or other disposition

BLM analyzed a range of alternatives and module delivery options which met the purpose and need of the proposed action. The range of alternatives was developed by resource specialists from BLM and cooperating agencies, and from comments received during scoping, including those concerning potential impacts to subsistence uses and resources.

BLM has determined that Alternative B, combined with Module Delivery Option 3, involves the minimal amount of public lands necessary to fulfill the purpose and need of the proposed action. Alternative B would include five drill sites (BT1, BT2 , BT3, BT4, and BT5), WPF, WOC, constructed freshwater reservoir, an all-season gravel road connection extending from the GMT-2 drill site southwest to the WPF, an airstrip, infield and export pipelines, gravel roads (including eight turnouts with subsistence/tundra access ramps and seven associated bridges) connecting the five drill sites to the WPF, and a water source access road near BT5 in support of development of oil reserves from the BTU reservoir. Gravel roads would cross Judy (Iqalliqpik), Judy (Kayyaaq), and Fish (Uvlutuuq) creeks. The foregoing facilities are all necessary to reasonably develop the targeted oil and gas resources. All action alternatives evaluated in the EIS (Alternatives B, C, and D) involve the same basic area of development occupancy and long-term operations on BLM-managed lands. Exclusion of any of these public lands from BLM approval would preclude the Project Proponent from fully developing the oil and gas interests within its leaseholds, in contravention of Proponent's lease rights.

In addition to Project infrastructure, the Proponent would also construct up to three boat ramps for subsistence uses. One of the boat ramps (common to all action alternatives) would provide access to the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and GMT-1. UP to two additional boat ramps would be constructed along Judy (Iqalliqpik) Creek and/or Fish (Uvlutuuq) Creek pending further community input. All three boat ramps would be accessed via short roads connected to Project roads near Project bridges. During construction, the Project would also develop the Tiŋmiaqsiuġvik gravel mine site, with to two distinct mine pits. Under Module Delivery Option 3, large sealift modules (weighing between 3,000 and 4,000 tons) would be received at the Oliktok Dock and

transported over the existing gravel road network in Kuparuk south to DS2P. From DS2P, the modules would be transported via task-specific ice road across the Colville River (near Ocean Point) to the Project area near the GMT-2 drill site. From GMT-2, the modules would be transported over Project gravel roads to their installation location. Alternative B, combined with Module Delivery Option 3, would have a total footprint of 625.1 acres (459.1 acres of gravel footprint and 166.0 acres of excavation). All Project activities were developed in accordance with the 2013 NPR-A IAP ROD, the guidelines set forth in the 2020 NPR-A Final IAP/EIS, and Section 404 of the Clean Water Act, which all require lessees to minimize facility footprints and propose siting and alignment of facilities in such a manner as to minimize environmental impacts to various resources (e.g., caribou, wetlands).

3. Reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions

When BLM began its NEPA scoping process for the current plan amendment, it internally identified subsistence as one of the major issues to be addressed. BLM gathered information during consultation with Native entities, regional working groups, cooperating agencies, and during public meetings and ANILCA Subsistence Hearings in affected communities to craft a final proposed action which includes protective measures in the form of lease stipulations, BMPs and Project design elements that serve to minimize adverse impacts to subsistence uses. These protective measures and Project design elements are summarized herein but are described in detail in Willow MDP FEIS Section 3.16.2.1.1, *Applicable Lease Stipulations and Best Management Practices*, and Willow MDP FEIS Appendix I.1, *Avoidance, Minimization, and Mitigation*.

Several existing protective measures apply which would minimize adverse impacts to subsistence resource availability and abundance, as well as subsistence use areas, and subsistence access associated with the construction, drilling, and operation of oil and gas facilities. BLM is currently revising the NPR-A IAP (BLM 2013), including potential changes to required BMPs (described as ROPs in BLM [2020]). Updated ROPs adopted in the revised NPR-A IAP would replace existing BMPs (BLM 2013). The Willow MDP ROD will detail which measures would be implemented for the Project. FEIS Table 3.16.4 (Section 3.16.2.1.1) summarizes new ROPs or proposed substantial changes to existing NPR-A IAP BMPs that would help mitigate impacts to subsistence. Additionally, the Proponent has incorporated measures that would minimize adverse impacts to subsistence uses and resources in their Project design. These include:

- The construction of a subsistence use boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and GMT-1 as well as up to two additional boat ramps which would be constructed along Judy (Iqalliqpik) Creek and/or Fish (Uvlutuuq) Creek pending further community input.
- The construction of eight turnouts with subsistence/ tundra access ramps along newly developed gravel roads.

Additional measures similar to NPR-A LSs and BMPs or other requirements and are included in the Final EIS Appendix I.1, Section 2.0, *Design Features to Avoid and Minimize Impacts*, to show the Project proponent's commitment to adhering to them. Examples include continuing to provide annual funding for Kuukpik Subsistence Oversight Panel and prohibiting Project employees from hunting and trapping activities while on active work status to avoid increased competition for subsistence and recreational wildlife resources. The Proponent may propose additional protective measures in subsequent phases.

Given these numerous protective measures that would apply to the Project to reduce subsistence impacts, the BLM determines that reasonable steps will be taken to minimize adverse impacts to subsistence uses and resources from the proposed action.

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Willow Master Development Plan

Appendix H
Spill Summary, Prevention, and Response Planning

August 2020

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List of Acronyms

ADEC	Alaska Department of Environmental Conservation
BLM	Bureau of Land Management
BMPs	best management practices
CPAI	ConocoPhillips Alaska, Inc.
EPA	U.S. Environmental Protection Agency
FLIR	forward-looking infrared
HDD	horizontal directional drilling
IAP	Integrated Activity Plan
LS	lease stipulations
NPR-A	National Petroleum Reserve in Alaska
ODPCP	Oil Discharge Prevention and Contingency Plan
Project	Willow Master Development Plan Project
ROP	Required Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure

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1.0 SPILL SUMMARY

Table H.1.1 summarizes drilling and operations spill types, spill volumes, spill likelihood, spill duration, and estimated geographic extent of spill for the action alternatives.

Table H.1.1. Potential Spill Types, Spill Volumes, Spill Likelihood, Spill Duration, and Estimated Geographic Extent of Spill during the Drilling and Operations Phases for Action Alternatives

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)[a]	Small Oil Spill Classification (10 to 99.9 gallons)[a]	Medium Oil Spill Classification (100 to 999.9 gallons)[a]	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)[a]	Large Oil Spill Classification (10,000 to 100,000 gallons)[a]	Very Large Oil Spill Classification (> 100,000 gallons)[a]	Likely Duration of Spill	Likely Geographic Extent of Spill
Oil wells	Shallow gas blowout	Drilling fluids (no produced fluids)	VL	VL	VL	VL	VL	VL	1 to 2 days	No crude oil would be spilled, but drilling muds and other drilling fluids could impact an area up to 20 to 25 acres adjacent to the well pad.
Oil wells	Reservoir blowout	Produced fluids and drilling fluids	VL	VL	VL	VL	VL	VL	A few days to a week or two	Modeling results suggest that up to 10% of the discharged oil would remain airborne as an aerosol and 90% would be expected to reach the ground surface in a swath up to 2,953 feet wide and up to 22,310 feet downwind of the well based on typical prevailing wind patterns at the time of the spill. (Details are in Section 4.3, *Potential Spills during Drilling and Operations*.)
Oil wells	Wellhead and well-casing leaks	Produced fluids	L	L	L	VL	VL	VL	A few hours for very small spills to a few days for large spills	Spills would be expected to be contained within the immediate vicinity of the well itself and would not be expected to reach areas off the gravel pad.
Pipelines	Facility piping	Produced fluids and various refined products	VH	VH	H	M	L	VL	Very short (less than 1 hour) for very small spills to a few days for large spills	Spills would be expected to be contained to the gravel pad and its immediate margin.
Pipelines	Infield flowlines	Multiphase produced fluids and produced water	L	L	L	VL	VL	VL	Very short (less than 4 hours) or could continue for days to weeks depending on the size and location of the leak along the flowline	Leaks could occur on gravel pads or on tundra and adjacent waterbodies between pads. Large spills that go undetected for a period of time could spread to an area a few acres in size before the spill is stopped. The area reached by materials from large spills would be influenced by the location and time of year of the spill. If a large spill were to occur in the vicinity of a river or during the spring when water flows are high, the geographic extent of such a spill could be larger.

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)[a]	Small Oil Spill Classification (10 to 99.9 gallons)[a]	Medium Oil Spill Classification (100 to 999.9 gallons)[a]	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)[a]	Large Oil Spill Classification (10,000 to 100,000 gallons)[a]	Very Large Oil Spill Classification (> 100,000 gallons)[a]	Likely Duration of Spill	Likely Geographic Extent of Spill
Pipelines	Process piping	Processed (sales-quality) oil	VH	VH	H	M	L	VL	Very short (less than 1 hour) for very small spills to a few days for large spills before the leak is repaired	Process piping associated with well manifolds and processing at the WPF would be expected to be contained to the gravel pad or its immediate margin, with very little reaching adjacent areas. The area reached by large spills would be influenced by the location and time of year the spill occurred.
Pipelines	Export pipeline	Processed (sales-quality) oil and make-up water (seawater)	VL	VL	VL	VL	VL	VL	Very short (less than 1 hour) or could continue for days to weeks before being detected depending on the size and location of the leak along the pipeline corridor	Leaks could occur on the WPF gravel pad or at the tie-in gravel pad at Alpine CD4N or on tundra and adjacent waterbodies between pads. Very small spills would be expected to be limited to a small area in the immediate vicinity of the spill; however, larger spills that go undetected for a period of time could extend to an area several acres in size before being stopped. The spill's location and the time of year also influence the extent of the spill. For instance, if a large or very large spill were to occur in the vicinity of a river, the geographic extent of such a spill could be much higher.
Aboveground storage tanks	Large aboveground storage tanks	Various refined products and processed (sales-quality) oil	L	L	L	L	VL	VL	Would likely be noticed within a day of the start of the leak, but securing the leak could take a few days depending on where the leak occurred on the tank	Spilled material would be captured within secondary containment. In the unlikely event that a spill escaped the secondary containment, it is expected that the spill would be contained to the pad itself and would not reach the tundra, adjacent waterbodies, or other sensitive habitats.

Type	Spill Event	Type of Spill	Very Small Oil Spill Classification (< 10 gallons)[a]	Small Oil Spill Classification (10 to 99.9 gallons)[a]	Medium Oil Spill Classification (100 to 999.9 gallons)[a]	Medium-Large Oil Spill Classification (1,000 to 9,999.9 gallons)[a]	Large Oil Spill Classification (10,000 to 100,000 gallons)[a]	Very Large Oil Spill Classification (> 100,000 gallons)[a]	Likely Duration of Spill	Likely Geographic Extent of Spill
Spills not specifically associated with petroleum development infrastructure	Spills associated with warehouse activities; storage facilities; equipment maintenance and repair activities; vehicle accidents; and vehicle and equipment refueling activities	Typically, a variety of refined products	VH	VH	H	L	VL	VL	On-pad spills would be observed and responded to quickly and be of short duration (less than 0.5 day). Spills from vehicle accidents would happen at the time of the accident and last less than an hour.	Spills would remain on the pad or within secondary containment; damage to areas adjacent to pads would not be anticipated. If a spill occurred due to a large bulk-fuel tanker truck accident and the tanker volume was released, the geographic extent would likely include the road, adjacent roadside habitats, and possibly waterbodies. The geographic extent of a spill of this size would vary depending location of the accident and the season in which it occurred; however, the spill would be localized and likely affect an area up to 0.5 acre in size.

Note: H (high); L (low); M (medium); VH (very high); VL (very low); WPF (Willow processing facility).
[a] Oil spill size classifications denote the likelihood of a spill or release occurring.

2.0 SPILL PREVENTION AND RESPONSE PLANNING

As described in Chapter 4.0, *Spill Risk Assessment*, ConocoPhillips Alaska, Inc. (CPAI) would implement numerous spill prevention and response planning measures as part of the Willow Master Development Plan Project (Project) to help prevent spills and minimize damage to human health and the environment in the unlikely event they occur. Spill prevention measures include the following:

- Specific design features to detect and contain leaks
- Adherence to best management practices (BMPs) and lease stipulations (LS)
- Systems to notify operators of potential leaks
- Procedures to maintain the pipelines and other infrastructure

Response planning measures include the following:

- Developing numerous response planning documents for a variety of spill scenarios
- Providing necessary equipment to prevent and respond to spills
- Ensuring personnel are trained and knowledgeable about the procedures to respond efficiently and effectively to oil spills and other accidental releases

Project facilities would be designed to mitigate spills with spill prevention measures and spill response capabilities. CPAI would implement a pipeline maintenance and inspection program and an employee spill prevention training program to further reduce the likelihood of spills occurring. CPAI's design of production facilities would include provisions for secondary containment of hydrocarbon-based and other hazardous materials, as required by state and federal regulations. If a spill occurs on a gravel or ice pad, the fluid would remain on the pad unless the spill is near a pad edge or exceeds the pad's retention capacity. Fuel transfers near pad edges would be limited to the extent practicable to mitigate this risk. In addition to regulations governing spill prevention and response, the Project would be managed under the BLM LSs and BMPs described for solid waste, fuel, and chemical storage (BLM 2013) (Section 2.5, *Applicable Lease Stipulations and Best Management Practices*).

2.1 Spill Prevention

Spill prevention and response measures that would be used during construction, drilling, and operations would be outlined in the Project's Oil Discharge, Pollution, and Contingency Plan (ODPCP) and the Spill Prevention Control and Countermeasures (SPCC) Plan. The intent of the ODPCP and SPCC Plan is to demonstrate CPAI's capability to prevent oil spills from entering the water or land and to ensure rapid response in the event a spill occurs. The ODPCP would comply with applicable State of Alaska requirements (AS 46.04.030, 18 AAC 75) for spill prevention and federal U.S. Environmental Protection Agency (EPA) regulations in 40 CFR 112, D (Facility Response Plans). The SPCC Plan would comply with the federal EPA regulations contained in 40 CFR 112.

CPAI would design and construct pipelines to comply with state, federal, and local regulations. Pipelines would be constructed of high-strength steel and would have wall thicknesses in compliance with or exceeding design code regulatory requirements. Pipeline welds would be validated using nondestructive examination (i.e., radiography or ultrasonic) during pipeline construction to ensure their integrity and pipelines would be hydrostatically tested prior to operation. The production fluids, water injection, seawater, and export pipelines would be fully capable of accommodating pigs for cleaning and corrosion inspection.

CPAI would use two methods of leak detection for the seawater and diesel pipeline HDD crossings under the Colville River: leak detection by mass balance (primary) and optical leak detection (secondary and within the pipeline carrier casing). To further prevent a pipeline leak under the Colville River, the diesel and seawater pipelines would be installed inside high-strength casing pipe. Simultaneous failure of both the pipeline and the associated casing is highly unlikely. If diesel or seawater leaked from the pipelines, it would be contained within the space between the outer walls of the pipelines and the inner wall of the casing rather than reaching the subsurface river environment. The design is analogous to secondary containment provided as a spill prevention technique for storage tanks. The casing would perform a second function: accommodating the external loads that would normally be carried by the pipeline. The casing and pipelines would not apply significant, direct loads onto each other, with some load transferred by the plastic casing isolators attached to the carrier pipeline. A deformation of the casing pipe would not necessarily cause deformation of the carrier pipelines, thus providing protection against external loads. To prevent external corrosion, the casing and pipelines would be protected by an abrasion-resistant coating, in accordance with industry standards.

There would be an increased potential for pipeline spills where pipelines would cross under roads due to corrosion of the buried portion of the pipelines. The likelihood of corrosion occurring would be reduced through design and monitoring. CPAI would maintain corrosion control and inspection programs that include ultrasonic inspection, radiographic inspection, coupon monitoring, metal loss deflection pigs and geometry pigs (applicable to pig-capable pipelines), and infrared technology. The inspection programs are API Standard 570–based programs that focus inspection efforts on areas with the greatest potential for spills.

2.2 Spill Response

CPAI would implement the Project's ODPCP and SPCC Plan to minimize accidental oil spills and associated impacts. Through the ODCP, CPAI would demonstrate that readily accessible inventories of fit-for-purpose oil spill response equipment and personnel would be available for use at Project facilities. In addition, a state-registered primary response action contractor would serve as CPAI's primary response action contractor and would provide trained personnel to manage all stages of a spill response, including containment, recovery, and cleanup.

The threat to rivers and streams from a possible pipeline spill would be minimized by quickly intercepting, containing, and recovering spilled oil near the waterway-pipeline crossing points. The road would be used for access and staging for spill response. Valves would be installed on each side of pipeline crossings at Fish (Uvlutuuq) Creek and Judy (Iqalliqpik) Creek, which would allow isolation of produced fluids pipelines on either side of the bridges to minimize potential spill impacts in the event of a leak or break.

Spill response equipment would be pre-staged at strategic locations across the Project area as outlined in the ODPCP for an initial response. This strategy would facilitate the rapid deployment of equipment by personnel. The effective response time would be enhanced with pre-staged equipment, which would expedite equipment deployment to contain and recover spilled oil, reducing the overall affected area. During summer, pre-staged containment booms would be placed at strategic locations near selected river channels to facilitate a rapid response. Pre-deployed booms may also be placed within selected stream channels to mitigate a spill, should one occur. During summer, spill containment equipment would likely be staged or deployed using helicopters. If a spill occurs, spill response activity could include watercraft (e.g., airboats, jetboats) use to access affected areas.

2.2.1 Pre-Staged and Pre-Deployed Equipment

Dedicated oil spill response equipment (e.g., boom, anchors, skimmers, hoses, pumps, portable storage) would be pre-staged and stored in connexes at dedicated storage locations near the pipelines and HDD crossing of the Colville River. Pre-staged equipment would be placed in close proximity to facilities and infrastructure, and in areas that are easily accessible, allowing for quick deployment. This includes equipment pre-staged along the east bank of the Colville River, just north of the existing Alpine HDD pipeline crossing (CPAI 2018).

Spill response team personnel may also pre-deploy diversionary or exclusion booms in the rivers each summer, including in the Colville River. Specific boom-laying configurations, and the exact footage lengths of booms pre-staged at each site may vary in response to seasonal changes in the river channel and weather-driven fluctuations in the river currents. At each pre-staging site, boom sections and anchors would be staged on the shoreline in a manner that optimizes the boom's intended use for containment and recovery. Response equipment would be maintained in such a manner that it could be deployed rapidly and in a condition for immediate use. CPAI would routinely inspect and test on-site response equipment. CPAI's spill response contractor would also perform routine inspection and maintenance of all response equipment.

CPAI currently pre-stages and pre-deploys equipment throughout the Alpine and Greater Mooses Tooth developments (Figure H.2.1), including spill response equipment and pre-deployed boom. Figure H.2.1 also reflects general planned locations for pre-staged and pre-deployed spill response equipment (CPAI 2020).

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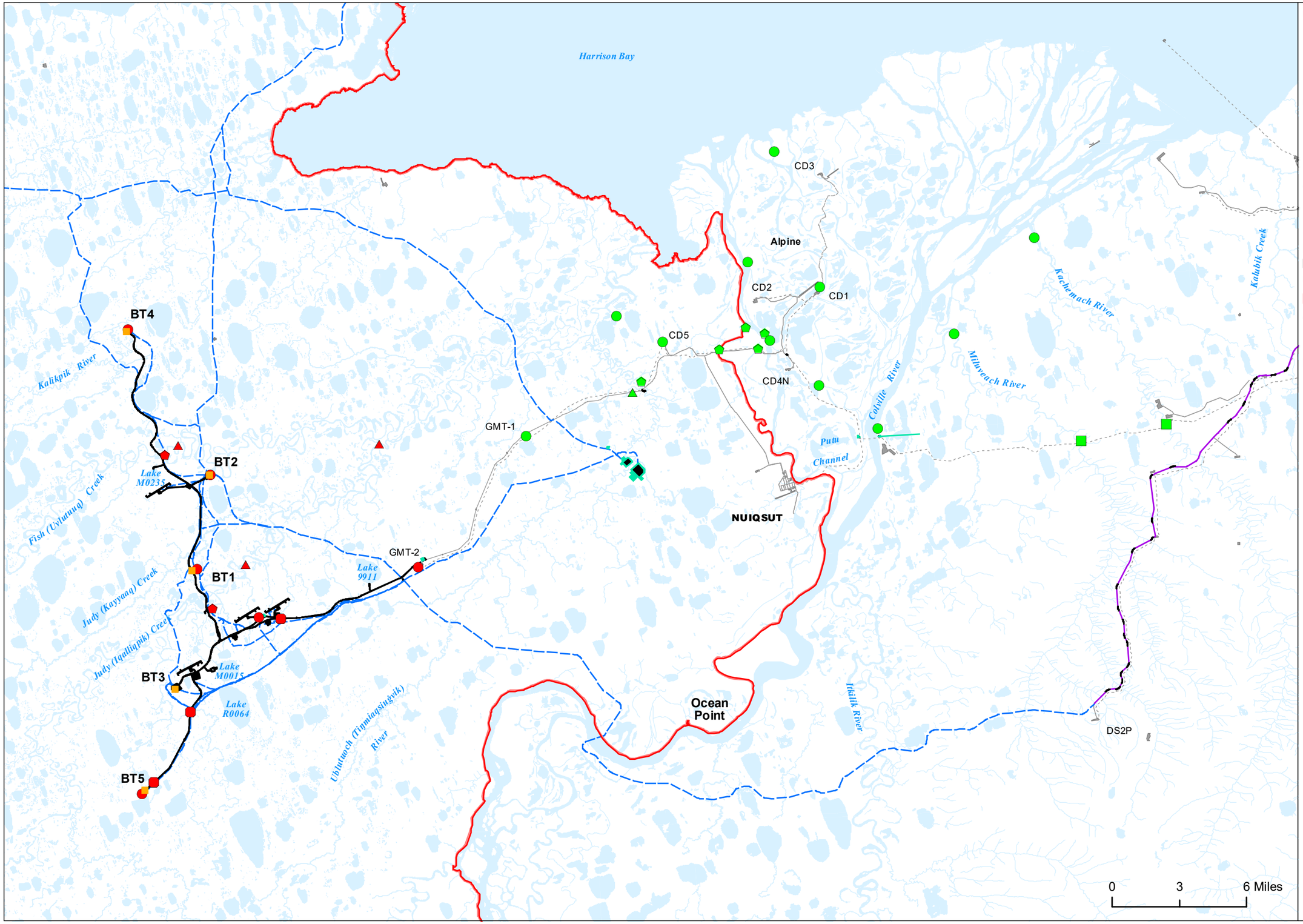

Existing Spill Response Equipment
- Existing- Pre-staged equipment
- Existing - Pre-staged equipment/ Pre-deployed boom
- Existing - Pre-deployed boom
- Existing - Pre-deployed boom

Palnned Spill Response Equipment
- Planned - Pre-staged equipment
- Planned - Pre-deployed boom
- Planned - Pre-staged boom
- Planned - Pre-staged/Culvert blocking equipment

Willow Proposed Development Features
- Drill Site (Not to Scale)
- Ice Road
- Option 3 Existing Road
- Ice Pad
- Gravel Footprint

Land Designation
- National Petroleum Reserve in Alaska

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure H.2.1

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2.3 Spill Response Training and Inspections

CPAI provides regular training for its employees and contractors on the importance of preventing oil or other hazardous material spills, including new employee orientation, annual environmental training seminars, and appropriate certification classes for specific issues covering spill prevention. CPAI's employees and contractors participate in frequent safety meetings that address spill prevention issues, as appropriate. The CPAI Incident Management Team participates in regularly scheduled training programs and conducts spill response drills in coordination with federal, state, and local agencies. Employees are encouraged to participate in the North Slope Spill Response Team where members receive regularly scheduled spill response training to ensure the continuous availability of skilled spill responders on the North Slope.

CPAI is required to conduct visual examinations of pipelines and facility piping with a frequency defined under 49 CFR 195.412 and 18 AAC 75.055 during operations at a minimum interval not exceeding 3 weeks. CPAI would provide aerial overflights as necessary to allow inspection both visually and with the aid of infrared technology, when required. Infrared technology allows for spill identification based on the temperature "signature" resulting when warm fluids leak. Infrared technology can detect warm spots in low-light conditions or when other circumstances such as light fog or drifted snow limit visibility. Infrared technology can also identify trouble spots along pipelines, such as damaged insulation, before a problem develops. CPAI would also conduct regular visual inspections of facilities and pipelines from gravel roads, where available, and from ice roads and aircraft for sections of pipelines not paralleled by gravel roads (Alternatives C and D).

2.3.1 Existing Area-Wide Oil Spill Response Training and Reconnaissance

In March 2020, BLM issued a Draft Update on North Slope Permitting and Activities (BLM 2020b) for the NPR-A, including the Willow area. BLM intends to renew a right-of-way authorizing Alaska Clean Seas to conduct oil spill response training, deploy the equipment cache, and perform reconnaissance to determine the feasibility of pre-deploying a containment boom.

Summer reconnaissance activities will occur to determine the potential location of pre-staged equipment and pre-deployed containment boom sites and to obtain area knowledge to increase oil spill response preparedness. Training will consist of transporting Spill Response Team members to the sites and deploying boom and small skimming systems to determine the best methods of responding to an oil spill. This training would continue to identify ideal sites for collection and recovery of oil spilled from proposed pipelines and operating areas. These activities will occur regardless of the Project; however, it will affect preparedness and response for the Project should a spill occur and thus is considered when disclosing the Project's response training.

2.4 Fuel and Chemical Storage

Fuel and other chemicals would be stored primarily at the Willow central processing facility, with additional storage at the Willow Operations Center and drill sites. Diesel fuel would be stored in temporary tanks on-site during construction under all alternatives. During drilling and operations, the Willow Operations Center would include a diesel fuel supply storage tank(s), an associated fueling station, and a tank farm to store methanol, crude flowback, corrosion inhibitor, scale inhibitor, emulsion breaker, and various other chemicals as required.

Drill sites would have temporary tanks to support drilling activity, including brine tanks, a cuttings and mud tank, and a drill rig diesel fuel tank built into the drill rig structure. Production and operations storage tanks at drill sites would include chemical storage tanks that may contain any of the following depending on Project needs: corrosion inhibitor, methanol, scale inhibitor, emulsion breaker, antifoam, or ultra-low sulfur diesel. Portable oil storage tanks to support well and pad operational activities and maintenance (i.e., well work and well testing) may be present on an as-needed basis.

Fuel and oil storage would comply with local, state, and federal oil pollution prevention requirements, according to an ODPCP and a SPCC Plan. Secondary containment for fuel and oil storage tanks would be sized as appropriate to container type and according to the requirements in 18 AAC 75 and 40 CFR 112. Fuel and chemical storage associated with the Project would be managed under Bureau of Land Management (BLM) LSs and BMPs (Section 2.5 of this appendix, *Applicable Lease Stipulations and Best Management Practices*).

2.5 Applicable Lease Stipulations and Best Management Practices

Table H.2.1 summarizes existing and proposed NPR-A Integrated Activity Plan (IAP) LSs and BMPs that would apply to Project actions on BLM-managed lands and are intended to mitigate impacts to the environment from

spills and accidental releases. CPAI would comply with applicable existing NPR-A IAP LSs and BMPs related to fuels and hazardous materials handling and storage, spill prevention, and spill response, as outlined in BLM (2013). BLM is currently revising the NPR-A IAP (BLM 2013), including potential changes to required BMPs (described as Required Operating Procedures [ROPs] in BLM [2020a]). Updated ROPs adopted in the new NPR-A IAP will replace existing BMPs (BLM 2013). The Willow Master Development Plan Record of Decision will detail which of the measures described below will be implemented for the Project. Table H.2.1 also summarizes new ROPs or proposed substantial changes to existing NPR-A IAP BMPs that would help mitigate impacts from potential spills. Although many of the LSs (where they are applied as BMPS) and BMPs have proposed minor language revisions, Table H.2.1 includes only changes that would be apparent in the paraphrased table text. The full text of the changes to BMPs is provided in BLM (2020a).

Table H.2.1. Summary of Applicable Lease Stipulations and Best Management Practices Intended to Mitigate Impacts from Potential Spills

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 Integrated Activity Plan Revisions
BMP A-3	Minimize pollution through effective hazardous-materials contingency planning.	Prepare and implement a hazardous materials emergency contingency plan before transportation, storage, or use of fuel or hazardous substances.	Changes do not affect text as described.
BMP A-4	Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.	Develop a comprehensive spill prevention, control, and countermeasure plan.	Develop a comprehensive spill prevention, control, and countermeasure plan, if oil storage capacity is 1,320 gallons or greater.
BMP A-5	Minimize the impact of contaminants from refueling operations on fish, wildlife, and the environment.	Refueling of equipment within 500 feet of the active floodplain of any water body is prohibited. Fuel storage stations shall be located at least 500 feet from any waterbody.	Refueling of equipment within 100 feet of the active floodplain of any waterbody is prohibited. Fuel storage stations shall be located at least 100 feet from any waterbody.
BMP A-7	Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.	Discharge of produced water in upland areas and marine waters is prohibited.	BMP withdrawn: No similar requirement; discharges of produced fluids are addressed by the State of Alaska under the water quality standards, wastewater discharge, and permitting requirements contained in 18 AAC 70, 18 AAC 72, and 18 AAC 83.
ROP A-13	Prevent the release of poly- and perfluoroalkyl substances associated with the use of aqueous film-forming foam, a firefighting foam designed to extinguish flammable and combustible liquids and gases.	No similar requirement.	At facilities where fire-fighting foam is required, use fluorine-free foam unless other state or federal regulations require aqueous film-forming foam use. If aqueous film-forming foam use is required, contain, collect, treat, and properly dispose of all runoff, wastewater from training events, and, to the greatest extent possible, from any emergency response events
BMP E-4	Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.	All pipelines shall be designed, constructed, and operated under an authorized officer-approved Quality Assurance/Quality Control plan.	No similar requirement; the State of Alaska enforces pipeline design and construction standards to minimize the potential for leaks.

Source: BLM 2013, 2020a
Note: BMP (best management practice); LS (lease stipulation); ROP (required operating procedure).

3.0 REFERENCES

BLM. 2013. *National Petroleum Reserve-Alaska Integrated Activity Plan/Environmental Impact Statement Record of Decision*. Anchorage, AK.

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-----. 2020b. *Update on BLM North Slope Permitting and Activities, March 2020*. Fairbanks, AK.

CPAI. 2018. *Oil Discharge Prevention and Contingency Plan: Alpine Field and Satellites and Alpine Pipeline System*. ADEC Plan No.17-CP-4140. Anchorage, AK.

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Willow Master Development Plan

Appendix I
Avoidance, Minimization, and Mitigation Technical Appendix

August 2020

Appendix I.1
Avoidance, Minimization, and Mitigation

Appendix I.2
ConocoPhillips Road Optimization Memorandum

Appendix I.3
Dust Control Plan

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Willow Master Development Plan

Appendix I.1

Avoidance, Minimization, and Mitigation

August 2020

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List of Acronyms

µPa	micropascal
°F	degrees Fahrenheit
ADEC	Alaska Department of Environmental Conservation)
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
agl	above ground level
AOGCC	Alaska Oil and Gas Conservation Commission)
BLM	Bureau of Land Management
BMP	best management practice
BT1	Bear Tooth 1 drill site
BT2	Bear Tooth 2 drill site
BT3	Bear Tooth 3 drill site
BT4	Bear Tooth 4 drill site
BT5	Bear Tooth 5 drill site
CPAI	ConocoPhillips Alaska, Inc.
dB	decibel
DEW	Distant Early Warning
DMLW	Division of Mining, Land, Water
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
GIS	geographic information system
GMT-1	Greater Mooses Tooth 1
GMT-2	Greater Mooses Tooth 2
HDD	horizontal directional drilling
IAP	Integrated Activity Plan
ITR	Incidental Take Regulation
LS	lease stipulation
MDP	Master Development Plan
MMPA	Marine Mammal Protection Act
mph	miles per hour
MTI	module transfer island
NMFS	National Marine Fisheries Service

No.	number
NPR-A	National Petroleum Reserve in Alaska
NSB	North Slope Borough
OHW	ordinary high water
PM	particulate matter
Project	Willow Master Development Plan Project
ROD	Record of Decision
ROP	Required Operating Procedures
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VSM	vertical support member
WSE	water surface elevation
WPF	Willow Processing Facility

1.0 APPLICABLE LEASE STIPULATIONS AND BEST MANAGEMENT PRACTICES

The 2013 National Petroleum Reserve in Alaska (NPR-A) Integrated Activity Plan (IAP)/Environmental Impact Statement (EIS) Record of Decision (ROD) established performance-based lease stipulations (LSs) and best management practices (BMPs) that apply to oil and gas activities within the NPR-A (BLM 2013). Table I.1.1 summarizes NPR-A IAP LSs and BMPs that would apply to the Willow Master Development Plan Project (Project) and are intended to mitigate Project impacts. The Bureau of Land Management (BLM) is currently revising the NPR-A IAP, including potential changes to required BMPs (described as Required Operating Procedures [ROPs] in BLM [2020]). Updated BMPs adopted in the new NPR-A IAP will replace existing BMPs (BLM 2013); however, applicable LSs would not change because LSs are fixed at the time of the lease issuance. All projects are subject to the BMP/ROPs that are in place at the time the permit for development is issued. (The reader is referred to Section 2.2.7, Lease Stipulations, Required Operating Procedures, and Lease Notices, of the 2020 IAP/EIS for further discussion on this topic). ROPs described in Table I.1.1 describe the range of potential changes to the 2013 BMPs, as proposed in Alternatives B, C, D, and E in BLM (2020). Although it is unknown which ROPs will be adopted in BLM's NPR-A IAP ROD, those ROPs would replace existing (2013) BMPs, if the NPR-A IAP ROD is published before the Willow Master Development Plan (MDP) ROD. The Willow MDP ROD will detail which of the measures described below will be implemented for the Project. Although many of the ROPs have proposed minor language revisions from the 2013 BMPs, Table I 1.1 includes only changes that would be apparent in the paraphrased table text. Full text of the changes to BMPs is provided in BLM (2020).

The BMPs are organized to address the following topics:

A. Waste prevention, handling, disposal, spills, air quality, and public health and safety
B. Water use for permitted activities
C. Winter overland moves and seismic work
D. Oil and gas exploratory drilling
E. Facility design and construction
F. Use of aircraft for permitted activities
G. Oil field abandonment
H. Subsistence consultation for permitted activities
I. Orientation programs associated with permitted activities
J. Endangered Species Act Section 7 consultation process
K. Additional protections that apply in select biologically sensitive areas
L. Summer vehicle tundra access
M. General wildlife and habitat protection

Table I.1.1. Applicable Lease Stipulations and Best Management Practices

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP A-1	Protect the health and safety of the general public by disposing of solid waste and garbage in accordance with applicable federal, state, and local law and regulations.	Areas of operation shall be left clean of all debris.	Changes do not affect text as described.
BMP A-2	Minimize impacts on the environment from non-hazardous and hazardous waste generation. Encourage continuous environmental improvement. Protect the health and safety of oil field workers and the general public. Avoid human-caused changes in predator populations.	Prepare and implement a comprehensive waste management plan for all phases of exploration and development. Wastewater and domestic wastewater discharge to waterbodies and wetlands is prohibited unless authorized by a National Pollutant Discharge Elimination System or state permit.	Changes do not affect text as described.
BMP A-3	Minimize pollution through effective hazardous-materials contingency planning.	Prepare and implement a hazardous materials emergency contingency plan before transportation, storage, or use of fuel or hazardous substances.	Changes do not affect text as described.
BMP A-4	Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.	Develop a comprehensive spill prevention, control, and countermeasure plan.	Develop a comprehensive spill prevention, control, and countermeasure plan, if oil storage capacity is 1,320 gallons or greater.
BMP A-5	Minimize the impact of contaminants from refueling operations on fish, wildlife, and the environment.	Refueling of equipment within 500 feet of the active floodplain of any water body is prohibited. Fuel storage stations shall be located at least 500 feet from any waterbody.	Refueling of equipment within 100 feet of the active floodplain of any waterbody is prohibited. Fuel storage stations shall be located at least 100 feet from any waterbody.
BMP A-7	Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.	Discharge of produced water in upland areas and marine waters is prohibited.	BMP withdrawn: No similar requirement; discharges of produced fluids are addressed by the State of Alaska under the water quality standards, wastewater discharge, and permitting requirements contained in 18 AAC 70, 18 AAC 72, and 18 AAC 83.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP A-8	Minimize conflicts resulting from interaction between humans and bears during oil and gas activities.	Prepare and implement bear-interaction plans to minimize conflicts between bears and humans.	Text expanded to include other species of wildlife: Incorporate into infrastructure design measures to deter ravens, raptors, and foxes from nesting, denning, or seeking shelter. Provide the BLM with an annual report on any instances when, despite use of such measures, the use of infrastructure by ravens, raptors, and foxes did occur. Added Text: – Feeding wildlife is prohibited. – Prevent the emission of odors by installing kitchen hood exhaust filtration systems such as cleaners, filters, purifiers, and scrubbers. Activities not covered under Incidental Take Regulations must include the following in their wildlife interaction plan: – Guidelines for safe and nonlethal deterrence of polar bears from damaging property and endangering the public – Any injury or lethal take of a polar bear must be reported to the USFWS and the BLM within 24 hours.
BMP A-9	Reduce air quality impacts.	All oil and gas operations (vehicles and equipment) that burn diesel fuels must use “ultra-low sulfur” diesel.	BMP withdrawn: No similar requirement; duplicative with the EPA standard under Section 202 of the Clean Air Act amendments.
BMP A-10	Prevent unnecessary or undue degradation of the lands and protect health.	Air monitoring, (preconstruction and throughout the life of the Project) emissions inventory, emissions reduction plan, air quality modeling, and possibly mitigation measures.	Added text: Provide to the NSB, local communities, and tribes publicly available reports on air quality baseline monitoring, emissions inventory, and modeling results developed in conformance with this BMP.
BMP A-11	Ensure that permitted activities do not create human health risks through contamination of subsistence foods.	Lessee shall design and implement a monitoring study of contaminants in locally used subsistence foods.	No similar requirement.
BMP A-12	To minimize negative health impacts associated with oil spills.	Consider immediate health impacts, long-term monitoring for contamination, monitoring of human health, health promotion activities.	No similar requirement; this describes the BLM’s responsibility, and it is not a requirement of a permittee.
ROP A-13	Prevent the release of poly- and perfluoroalkyl substances associated with the use of aqueous film-forming foam, a firefighting foam designed to extinguish flammable and combustible liquids and gases.	No similar requirement.	At facilities where fire-fighting foam is required, use fluorine-free foam unless other state or federal regulations require aqueous film-forming foam use. If aqueous film-forming foam use is required, contain, collect, treat, and properly dispose of all runoff, wastewater from training events, and, to the greatest extent possible, from any emergency response events
ROP A-14	Vehicle Idling Standards: Reduce air emissions and protect human health.	No similar requirement.	All permanent camps (and temporary camps where feasible under alternative E), are required to provide vehicle plug-ins for engine warming systems (e.g., block heaters and oil pan heaters). Alternative E only: reduce extended vehicle idling when practical. In the winter, when vehicles are not in use for extended periods, they should be powered off and plugged in where plugs are available.
BMP B-1	Maintain populations of, and adequate habitat for fish and invertebrates.	Withdrawal of unfrozen water from rivers and streams during winter is prohibited.	Changes do not affect text as described.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP B-2	Maintain natural hydrologic regimes in soils surrounding lakes and ponds, and maintain populations of, and adequate habitat for, fish, invertebrates, and waterfowl.	Withdrawal of unfrozen water from lakes and the removal of ice aggregate from grounded areas less than 4-feet deep may be authorized on a site-specific basis depending on water volume and depth and the waterbody's fish community.	Withdrawal of unfrozen water from lakes and the removal of ice aggregate from grounded areas 4 feet deep or less during winter and withdrawal of water from lakes during summer may be authorized on a site-specific basis, depending on water volume and depth, the fish community, and connectivity to other lakes or streams. BLM must be notified within 48 hours of any observation of dead or injured fish on water source intake screens, in the hole being used for pumping, or within any portion of ice roads or pads. If observed at a particular lake, pumping must cease temporarily from that hole until additional preventive measures are taken to avoid further impacts on fish.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP C-1	Protect grizzly bear, polar bear, and marine mammal denning and/or birthing locations.	Cross-country use of heavy equipment is prohibited within one-half mile of occupied grizzly bear dens. Cross-country use of heavy equipment is prohibited within 1 mile of known or observed polar bear dens or seal birthing lairs.	Cross-country use of heavy equipment is prohibited within 1 mile of known or observed polar bear dens or seal birthing lairs. – Cross-country use of vehicles, equipment, and oil and gas activity is prohibited within 1 mile of known or observed polar bear dens, unless alternative protective measures are approved by the BLM and are consistent with the MMPA and the ESA. – Should previously unknown occupied dens be discovered within 1 mile of activities, work must cease and the USFWS must be contacted for guidance. – Operators seeking to carry out onshore activities in known or suspected polar bear denning habitat during the denning season (approximately November to April) must make efforts to locate occupied polar bear dens within and near areas of operation. All observations must be reported to the USFWS prior to the initiation of activities. – Restrict the timing of the activity to limit disturbance around dens. – Limit disturbance of activities to seal lairs in the nearshore area (< 3 meter water depth): – Maintain airborne sound levels of equipment below 100 dB re 20 µPa at 66 feet. If equipment will be used that differs from what was originally proposed, the applicant must inform the BLM. – On-ice operations after May 1 will employ a full-time, trained, protected species observer on vehicles to ensure that all basking seals are avoided by vehicles by at least 500 feet and will ensure that all equipment with airborne noise levels above 100 dB re 20 µPa are operating at distances from observed seals that allow for the attenuation of noise to levels below 100 dB. All sightings of seals will be reported to the BLM using a NMFS–approved observation form. – Ice paths must not be greater than 12 feet wide. No driving will be allowed beyond the shoulder of the ice path or off planned routes unless necessary to avoid ungrounded ice or for other human or marine mammal safety reasons. On-ice driving routes shall minimize travel over snow/ice/topographical features that could foster the development of birthing lairs. – No unnecessary equipment or operations (e.g., camps) will be placed or used on sea ice.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP C-2	Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.	Ground operations shall be allowed only when frost and snow cover are at sufficient depths to protect tundra. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation.	– Ground operations would only be allowed when frost and snow cover are at sufficient depth, strength, density, and structure to protect the tundra. Soils must be frozen to at least 23 degrees F at least 12 inches below the lowest surface height (e.g., inter-tussock space). Tundra travel would be allowed when there is at least 3 to 6 inches of snow (depending on the alternative) . For alternatives B, C, and D: Snow depth and snow density must amount to no less than a snow water equivalent of 3 inches over the highest vegetated surface (e.g., top of tussock) in the NPR-A. – Snow survey and soil freeze-down data collected for ice road or snow trail planning and monitoring shall be submitted to the BLM. – Clearing or smoothing drifted snow is allowed to the extent that the tundra mat is not disturbed. Only smooth pipe snow drags would be allowed for smoothing drifted snow. – For alternatives B, C, and D: avoid using the same routes for multiple trips, unless necessitated by serious safety or environmental concerns and approved by the BLM. This provision does not apply to hardened snow trails or ice roads. – Ice roads would be designed and located to avoid the most sensitive and easily damaged tundra types, as much as practicable. For alternatives B, C, and D: ice roads may not use the same route each year; ice roads would be offset to avoid portions of an ice road route from the previous 2 years. – See ROP E-13 for requirements to protect cultural and paleontological resources
BMP C-3	Maintain natural spring runoff patterns and fish passage, avoid flooding, prevent streambed sedimentation and scour, protect water quality, and protect stream banks.	Crossing of waterway courses shall be made using a low-angle approach. Crossings that are reinforced with additional snow or ice ("bridges") shall be removed, breached, or slotted before spring breakup. Ramps and bridges shall be substantially free of soil and debris.	Added text: – Provide to BLM any ice thickness and water depth data collected at ice road or snow trail stream crossings during the pioneering stage of road/trail construction. – In the spring, provide the BLM with photographs of all stream crossings that have been removed, breached, or slotted.
BMP C-4	Avoid additional freeze-down of deep-water pools harboring over-wintering fish and invertebrates used by fish.	Travel up and down streambeds is prohibited unless demonstrated that there will be no additional impacts to over-wintering fish or the invertebrates they rely on.	Some travel up and down streambeds would be allowed by the individual vehicles collecting snow from river drifts or ice aggregate from the channel (where ice is grounded).

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP E-1	Protect subsistence use and access to subsistence hunting and fishing areas and minimize the impact of oil and gas activities on air, land, water, fish, and wildlife resources.	All roads must be designed, constructed, maintained, and operated to create minimal environmental impacts and to protect subsistence use and access to subsistence hunting and fishing areas.	Added text: – Subsistence pullout and access/egress ramps would be constructed in adequate numbers and at appropriate locations on all roads to facilitate access to subsistence use areas. Prior to constructing a road, permittees shall gather input from communities regarding the number and location of pullouts and associated access ramps. – Permittees shall construct a subsistence pullout and boat ramp at all crossings of heavily used subsistence rivers, as determined by consultation with the community. – Permittees must allow subsistence use of permanent gravel roads and appropriate ice roads, consistent with safe operations, and shall provide communities and BLM with concise policies regarding use of all roads and hunting prohibitions, if any, along the roads and near facilities. – Permittees shall ensure that any road use guidelines and updated road maps are disseminated throughout the communities, including making them available online and through social media. – Before ice road construction begins, permittees associated with ice road construction shall hold community meetings to describe the routes and relevant information on all ice roads that would be constructed.
LS E-2	Protect fish-bearing water bodies, water quality, and aquatic habitats.	Permanent facilities, including roads, airstrips, and pipelines, are prohibited upon or within 500 feet as measured from the ordinary high-water mark of fish-bearing waterbodies.	Changes do not affect text as described.
LS E-3	Maintain free passage of marine and anadromous fish and protect subsistence use and access to subsistence hunting and fishing.	Causeways and docks are prohibited in river mouths or deltas. Artificial gravel islands and bottom-founded structures are prohibited in river mouths or active stream channels on river deltas.	Added text: Permittees shall submit a minimum of 2 years of data on fish, circulation patterns, and water quality with an application for construction. A postconstruction monitoring program, developed in consultation with appropriate federal, state, and NSB agencies, shall be required to track circulation patterns, water quality, and fish movements around the structure.
BMP E-4	Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.	All pipelines shall be designed, constructed, and operated under an authorized officer-approved Quality Assurance/Quality Control plan.	No similar requirement; the State of Alaska enforces pipeline design and construction standards to minimize the potential for leaks.
BMP E-5	Minimize impacts of the development footprint.	Facilities shall be designed and located to minimize the development footprint.	Added text: – For alternatives B, C, and D, use impermeable liners under gravel pads to minimize the potential for hydrocarbon spills. – Where aircraft traffic is a concern, balance gravel pad size and available supply storage capacity with potential reductions in the use of aircraft to support oil and gas operations.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP E-6	Reduce the potential for ice-jam flooding, impacts to wetlands and floodplains, erosion, alteration of natural drainage patterns, and restriction of fish passage.	Stream and marsh crossings shall be designed and constructed to ensure free passage of fish, reduce erosion, maintain natural drainage, and minimize adverse effects to natural stream flow.	Added text: – Stream and marsh crossings will be designed on at least one year of relevant hydrologic data. Additional years of hydrologic data collection may be required if more information is needed to design the crossing structure in order to attain the BMP. – The crossing structure design shall account for permafrost, sheet flow, additional freeboard during breakup, and other unique conditions of the arctic environment. – A minimum of 1 year of fish sampling is required at any stream crossing where flow is channelized, and additional years of fish sampling may be required at sites where the determination of anadromous fish presence is still in question. – A minimum of 1 year of hydrologic data collection is required at stream and marsh crossings. Additional years of hydrologic data collection may be required if more information is needed to design the crossing structure in order to attain the BMP objective and meet requirements. – All proposed crossing designs would adhere to the standards outlined in fish passage design guidelines developed by the USFWS Alaska Fish Passage Program (USFWS 2019), USFWS *Culvert Design Guidelines for Ecological Function* (USFWS 2020), *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings* (USFS 2008), and other generally accepted BMPs prescribed by BLM.
BMP E-7	Minimize disruption of caribou movement and subsistence use.	Pipelines and roads shall be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities.	Added Text: – Aboveground pipelines shall have a nonreflective finish. – When laying out oil and gas developments, permittees shall orient infrastructure to minimize impeding caribou migration and to avoid corralling effects. – Before the construction of permanent facilities is authorized, BLM will require a study of caribou movement for the impacted herd. The permittee may be required to conduct this study, or this requirement may be waived if an acceptable study specific to that herd has been completed within the last 10 years and is approved for use by BLM.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP E-8	Minimize the impact of mineral materials mining activities on air, land, water, fish, and wildlife resources.	Gravel mine site design and reclamation will be in accordance with a plan approved by the authorized officer and in consultation with appropriate federal, state, and North Slope Borough regulatory and resource agencies.	Added text: – The plan shall consider locations outside the active floodplain or designing gravel mine sites within active floodplains to serve as water reservoirs if environmentally beneficial. – Incorporate as much as practicable the storage and reuse of sod/overburden for the mine site or at other disturbed sites on the North Slope. – Removal of greater than 100 cubic yards of bedrock outcrops, sand, and/or gravel from cliffs is prohibited. – Any extraction of sand or gravel from an active river or stream channel shall be prohibited unless preceded by a hydrological study that indicates no potential impact on streamflow, fish, turbidity, and the integrity of the river bluffs, if present. – Mine pit design and methods shall be engineered to minimize permafrost regime disturbance and protect surface stability. – Geotechnical data collected for materials source reconnaissance (gravel exploration) shall be submitted to the BLM.
BMP E-9	Avoidance of human-caused increases in populations of predators of ground-nesting birds.	Utilize best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes. Feeding of wildlife is prohibited.	Requirements combined with ROP A-8 (Wildlife Interaction Plan).
BMP E-10	Prevention of migrating waterfowl, including species listed under the Endangered Species Act, from striking oil and gas and related facilities during low light conditions.	Illumination of all structures shall be designed to direct artificial exterior lighting inward and downward, rather than upward and outward.	Flagging of structures shall be required, such as elevated power lines and guy wires, to minimize bird collisions. All facility external lighting, during all months of the year, shall be designed to direct artificial exterior lighting inward and downward or be fitted with shields to reduce reflectivity in clouds and fog conditions, unless otherwise required by the Federal Aviation Administration.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP E-11	Minimize the take of species, particularly those listed under the Endangered Species Act and BLM Special Status Species, from direct or indirect interaction with oil and gas facilities.	– Before the approval of facility construction, aerial surveys for spectacled and Steller's eiders and yellow-billed loon shall be conducted within area proposed for development. – Surveys shall be conducted by the lessee for at least 3 years before authorization of construction. – Roads and facilities shall be sited to minimize impacts to nesting and brood-rearing eiders and their preferred habitats. – Power and communication lines shall either be buried in access roads or suspended on VSMs except in rare cases. – Communication towers should be located on existing pads as close as possible to buildings or other structures and on the east or west side of buildings or other structures if possible. Support wires associated with communication towers and other similar facilities should be avoided. If support wires are necessary, they should be clearly marked along their entire length to improve visibility to low-flying birds. – Maintain a 1-mile buffer around all recorded yellow-billed loon nesting sites and a minimum 1,625-foot (500-meter) buffer around the remainder of the shoreline. Development will generally be prohibited within buffers unless no other option exists.	Measures related to bird collisions with infrastructure moved to ROPs E-10 and E-21. Submittal of a minimum of 3 years of site-relevant survey data will be required before authorization of construction if such construction is within spectacled and Steller's eider habitats. Maintain a minimum of 0.5-mile buffer around all recorded yellow-billed loon nest sites and shall be up to 1 mile where feasible.
BMP E-12	Use ecological mapping as a tool to assess wildlife habitat before development of permanent facilities to conserve important habitat types during development.	An ecological land classification map of the development area shall be developed before approval of facility construction.	Added text: Develop a separate map displaying detailed water flowlines and small-scale delineation of drainage catchments (for alternatives B, C, D: based on Light Detection and Ranging or other high-accuracy surface imaging).
BMP E-13	Protect cultural and paleontological resources.	Conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee or their designated representative shall notify the authorized officer and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer.	Added text: Primary investigators overseeing cultural surveys must meet the Secretary of the Interior's professional qualification standards for qualified professional archaeologists (36 CFR 61, Appendix A). Permittees shall avoid known cultural and paleontological sites by a minimum of 500 feet from the site boundary.
BMP E-14	Ensure the passage of fish at stream crossings.	To ensure that crossings provide for fish passage, all proposed crossing designs shall collect at least 3 years of hydrologic and fish data.	Similar requirement is BMP E-6.
BMP E-15	Prevent or minimize the loss of nesting habitat for cliff-nesting raptors.	Removal of greater than 100 cubic yards of bedrock outcrops, sand, or gravel from cliffs shall be prohibited. Any extraction of sand or gravel from an active river or stream channel shall be prohibited unless a hydrological study indicates no potential impact to integrity of the river bluffs.	Similar requirement is BMP E-8.
BMP E-16	Prevent or minimize the loss of raptors due to electrocution by power lines.	Comply with the most up-to-date industry-accepted suggested practices for raptor protection on power lines.	See ROP E-21 for additional requirements to reduce impacts on birds from utility lines and communication towers.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP E-17	Manage permitted activities to meet Visual Resource Management class objectives.	Submit a plan to best minimize visual impacts, consistent with the Visual Resource Management Class for the lands on which facilities would be located. A photo simulation of the proposed facilities may be a necessary element of the plan.	Changes do not affect text as described.
BMP E-18	Avoid and reduce temporary impacts to productivity from disturbance near Steller's or spectacled eider nests.	Activity within 200 meters of occupied nest will be restricted to existing pads and roads from June 1 to August 15; construction is prohibited within 200 meters of occupied nests. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 200 m of occupied Steller's and/or spectacled eider nests will be prohibited.	Revised text to: June 1 through July 31.
BMP E-19	Provide information to be used in monitoring and assessing wildlife movements during and after construction.	A representation, in the form of ArcGIS-compatible shape-files, of all new infrastructure construction, shall be provided to the authorized officer.	Changes do not affect text as described.
ROP E-21	Minimize the impacts on bird species from direct interaction with aboveground utility infrastructure.	No similar requirement. See BMP E-11 for similar requirement.	Added text: – Power and communication lines shall either be buried in access roads or suspended on vertical support members except in rare cases. – Communications towers should be located on existing pads and as close as possible to buildings or other structures, and on the east or west side of buildings or other structures if possible. Support wires associated with communication towers and other similar facilities should be avoided. If support wires are necessary, they should be clearly marked along their entire length to improve visibility to low flying birds.
ROP E-23	Mitigate the impacts of permanent infrastructure on caribou movement near Teshekpuk Lake.	No similar requirement.	Alternatives B,C, and D: Prior to the permitting of permanent infrastructure within the TCH Habitat Area (the 75% parturient calving caribou kernel), a workshop shall be convened to identify the optimal placement of infrastructure to minimize impacts on caribou, birds, and other wildlife. Alternative E: No similar requirement.

BMP F-1, ROPs F-2, F-3, and F-4	Minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities.	Ensure that aircraft used for permitted activities maintain altitudes specified in guidelines. Aircraft shall maintain an altitude of at least 1,500 feet above ground level when within ½ mile of cliffs identified as raptor nesting sites from April 15 through August 15 and an altitude of at least 1,500 feet above ground level when within ½ mile of known gyrfalcon nest sites from March 15 to August 15. Aircraft shall maintain an altitude of at least 1,000 feet above ground level (except for takeoffs and landings) over caribou winter ranges from December 1 through May 1. Caribou wintering areas will be defined annually by the authorized officer. Submit an aircraft use plan that addresses strategies to minimize impacts to subsistence hunting and associated activities, including but not limited to the number of flights, type of aircraft, and flight altitudes and routes, and shall also include a plan to monitor flights. Adjustments, including possible suspension of all flights, may be required by the authorized officer if resulting disturbance is determined to be unacceptable. The number of takeoffs and landings to support oil and gas operations with necessary materials and supplies should be limited to the maximum extent possible. During the design of proposed oil and gas facilities, larger landing strips and storage areas should be considered to allow larger aircraft to be employed, resulting in fewer flights to the facility. Use of aircraft, especially rotary wing aircraft, near known subsistence camps and cabins or during sensitive subsistence hunting periods (spring goose hunting and fall caribou and moose hunting) should be kept to a minimum. Aircraft shall maintain an altitude of at least 2,000 feet above ground level (except for takeoffs and landings) over the Teshekpuk Lake Caribou Habitat Area from May 20 through August 20. Aircraft use (including fixed wing and helicopter) in the Goose Molting Area should be minimized from May 20 through August 20. Hazing of wildlife by aircraft is prohibited. Pursuit of running wildlife is hazing. If wildlife begins to run as an aircraft approaches, the aircraft is too close and must break away. Fixed wing aircraft along the coast shall maintain minimum altitude of 2,000 feet when within a ½ mile of walrus haulouts. Helicopters used along the coast shall maintain minimum altitude of 3,000 feet and a 1-mile buffer from walrus haulouts. Aircraft used along the coast and shore fast ice zone shall maintain minimum altitude of 3,000 feet when within 1 mile from aggregations of seals.	Text moved to ROPs F-2 through F-4. Added text: F-2: Aircraft Use Plan. Permittees shall submit an aircraft use plan 60 days prior to activities. Projects with landings north of 70 degrees North latitude that will occur between June 1 and October 15 must submit estimates of takeoffs and landings no later than April 5. F-3: Minimum Flight Altitudes. Alternatives B, C, and D - Aircraft shall maintain the stated minimum altitudes above ground level. Amended flight altitudes (others remain the same): December 1–May 1—1,500 feet over caribou winter range. May 20–August 20—1,500 feet over the TCH Habitat Area. Alternative E: Except for takeoffs and landings, manned aircraft flights for permitted activities (fixed-wing and helicopters, unless specified) shall maintain a 1,500-foot minimum altitude agl throughout NPR-A. Exceptions to the 1,500-foot agl minimum altitude are listed below: a. Single-engine manned aircraft and unmanned aircraft systems devices should not knowingly fly within 0.5 miles of walrus haul-outs; or, if required, then maintain 2,000 feet agl when within 0.5 miles of walrus haul-outs. b. Helicopters and multi-engine aircraft should not knowingly fly within 1 mile of walrus haul-outs; or, if required, then maintain 3,000 feet agl and a 1-mile buffer from walrus haul-outs. c. Aircraft—3,000 feet agl when within 1 mile of aggregation of seals F-4: Reduce Impacts of Air Traffic on Subsistence Resources. – Minimize helicopter flights during peak caribou hunting within 2 miles of important subsistence rivers. The current peak dates are July 15 through August 15, but these dates may be revised periodically in consultation with affected communities and the NSB. – Minimize aircraft use near known subsistence camps and cabins and during sensitive subsistence hunting periods (spring goose hunting, summer and fall caribou and moose hunting) by adhering to the following guidelines: – Arrange site visits and flight schedules to conduct required activity near subsistence areas early in the season, on weekdays, and as early in the morning as possible; avoid holidays. – Note whether activities overlap heavily used subsistence rivers and determine if a potentially affected community should be notified. – Compare the proposed landing sites with the NSB camps and cabins map. If activities near camps or allotments cannot be avoided, contact the camp or allotment owner to discuss the timing of the visit.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
LS G-1	Ensure long-term reclamation of land to its previous condition and use.	Prior to final abandonment, land used for oil and gas infrastructure shall be reclaimed to ensure eventual restoration of ecosystem function.	Changes do not affect text as described. See BMP M-5 for additional requirements to reduce areas of bare soil.
BMP H-1	Provide opportunities for participation in planning and decision making to prevent unreasonable conflicts between subsistence uses and other activities.	Consult with affected communities per guidelines.	Alternatives B, C, and D: Projects that would occur within 50 miles of a community or fewer than 15 miles from the heavily used subsistence rivers listed in ROP F-4 shall submit a subsistence plan. Alternative E: Permittees shall submit a subsistence plan unless this requirement is waived by BLM.
BMP H-3	Minimize impacts to sport hunting and trapping species and to subsistence harvest of those animals.	Hunting and trapping by lessee's/permittee's employees, agents, and contractors are prohibited when persons are on "work status."	Changes do not affect text as described.
ROP H-4	Notification and consultation with Alaska native groups: Prevent unreasonable conflicts with subsistence access and activities by providing opportunities for consultation and incorporating input into project plans.	No similar requirement.	For projects that require a subsistence plan (BMP/ROP H-1), permittees shall prevent unreasonable conflicts with subsistence access, use areas, and schedules by facilitating consultation according to guidelines prescribed.
ROP H-5	Make data and summary reports derived from North Slope studies easily accessible.	No similar requirement.	Required monitoring studies, reports, and geographic information system data shall be posted online and available to the public.
BMP I-1	Minimize cultural and resource conflicts.	All personnel involved in oil and gas and related activities shall be provided information concerning applicable stipulations, BMPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region and attend an orientation once a year.	Changes do not affect text as described.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP J	Endangered Species Act - Section 7 Consultation. Lease areas may now or hereafter contain plants or animals, or their habitats determined to be threatened or endangered or some other special status. The BLM may recommend modifications to development proposals to further its conservation and management objective to avoid activities it has approved that would contribute to the need to list such a species or its habitat. The BLM may require modifications to or may disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat.	See Objective.	Updated to: Lease Notice 2: Compliance with the ESA
LS/ BMP K-1[a]	(Rivers) Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabins and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values.	Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines are prohibited in stream beds and adjacent to rivers listed. Rivers in the Project area that are listed include Colville River (2-mile setback), Fish (Uvlutuuq) Creek (3-mile setback), Judy (Iqalliqpik) Creek (0.5-mile setback), and	

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
LS/ BMP K-2[a]	(Deepwater Lakes) Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of deepwater lakes; the loss of spawning, rearing or over wintering habitat for fish; the loss of cultural and paleontological resources; impacts to subsistence cabins and campsites; and the disruption of subsistence activities.	Permanent oil and gas facilities are prohibited on the lake or lakebed and within one-quarter mile of the ordinary high-water mark of any deep lake (i.e., depth greater than 13 feet).	Changes do not affect text as described. Additional restrictions as described in BMP/ROP E-11 may also apply in those habitats.
BMP K-4a[a]	(Goose Molting Area) Minimize disturbance to molting geese and loss of goose molting habitat in and around lakes in the Goose Molting Area.	Within the Goose Molting Area: – No leasing, no permanent oil and gas facilities, except pipelines, would be allowed within 1.0 mile of the shoreline of selected lakes. – Water extraction from any lakes used by molting geese shall not alter hydrological conditions that could adversely affect identified goose feeding habitat along lakeshore margins. – Between June 15 and August 20, oil and gas facilities shall incorporate features (e.g., temporary fences and siting/orientation) that screen/shield human activity from view of any Goose Molting Area lake, as identified by BLM. – Aircraft use (fixed-wing and helicopter) shall be restricted from June 15 through August 20.	Changed to Stipulations K-6 and K-7. Some alternatives allow leasing. Some alternatives allow new infrastructure with limitations. Within the Goose Molting Area, no permanent oil and gas facilities, except for pipelines, would be allowed within 0.5 mile of the shoreline of selected lakes. Lakes were selected based on the 85% distribution of black brant within the Goose Molting Area.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP K-5[a]	(Teshekpuk Lake Caribou Habitat Area) Minimize disturbance and hindrance of caribou, or alteration of caribou movements through portions the Teshekpuk Lake Caribou Habitat Area that are essential for all season use, including calving and rearing, insect-relief, and migration.	Design and implement and report a study of caribou movement, avoidance design, travel restrictions. The study shall include a minimum of 4 years of current data on the TCH movements. – Within the Teshekpuk Lake Caribou Habitat Area, the permittee shall orient linear corridors when laying out oil and gas field developments to address migration and corralling effects and to avoid loops of road and/or pipeline that connect facilities. – Ramps over pipelines, buried pipelines, or pipelines buried under the road may be required in the Teshekpuk Lake Caribou Habitat Area where pipelines potentially impede caribou movement. – Major construction activities using heavy equipment (e.g., sand/gravel extraction and transport, pipeline and pad construction, but not drilling from existing production pads) shall be suspended within the Teshekpuk Lake Caribou Habitat Area from May 20 through August 20. If caribou arrive on the calving grounds prior to May 20, major construction activities will be suspended. – A number of ground and air traffic restrictions are specified, including, but not limited to, the following: – Major equipment, materials, and supplies to be used at oil and gas work sites in the Teshekpuk Lake Caribou Habitat Area shall be stockpiled prior to or after the period of May 20 through August 20 to minimize road traffic during that period. – Within the Teshekpuk Lake Caribou Habitat Area aircraft use (including fixed wing and helicopter) shall be restricted from May 20 through August 20. Restrictions may include prohibiting the use of aircraft larger than a Twin Otter. The permittee shall submit with the development proposal an Aircraft Use Plan that considers these and other mitigation. The Aircraft Use Plan shall also include an Aircraft Monitoring Plan. – Aircraft shall maintain a minimum height of 1,000 feet above ground level (except for takeoffs and landings) over caribou winter ranges from December 1 through May 1, and 2,000 feet above ground level over the Teshekpuk Lake Caribou Habitat Area from May 20 through August 20.	Changed to Stipulation K-9 Text revised: Federal mineral estate within 3 miles of Teshekpuk Lake, except for the southern shore, is open to leasing, subject to a no surface occupancy stipulation. Federal mineral estate within 1 mile of the southern shore of Teshekpuk Lake is open to leasing, subject to a no surface occupancy stipulation. – Before authorization of construction of permanent facilities, the BLM will require submittal of information on caribou movement for the TCH. The information shall include multiple years of seasonal distribution and movement of the TCH. The information must include some recent data and must be sufficient to capture a realistic picture of trends in distribution and movements. In the TCH Habitat Area (the 75% parturient calving kernel) The following standards would be applied to permitted activities: – Within the TCH Habitat Area (the 75% parturient calving kernel), permittee shall orient linear corridors when laying out oil and gas field developments to address seasonal distribution and avoid corralling effects from loops of road and/or pipeline that connect facilities. – Off-pad activities shall be suspended within TCH Habitat Area (the 75% parturient calving kernel) from May 20 through June 20, unless approved by the BLM. – Within the TCH Habitat Area (the 75% parturient calving kernel), from May 20 through August 20, traffic speed shall not exceed 15 miles per hour when caribou are within 0.5 miles of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, stockpiling equipment and materials, etc., to the extent practicable. The permittee shall submit with the development proposal a vehicle use plan (see ROP M-1) that considers these and any other mitigation. Traffic would be stopped: a) Temporarily to allow a crossing by 10 or more caribou. The permittee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation. b) By direction of the BLM, traffic may be stopped through the TCH Habitat Area (the 75% parturient calving kernel) for a limited amount of time, and only if necessary to prevent displacement of calving caribou.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
LS/ BMP K-6[a]	(Coastal Area) Protect coastal waters and their value as fish and wildlife habitat (including, but not limited to, that for waterfowl, shorebirds, and marine mammals), minimize hindrance or alteration of caribou movement within caribou coastal insect-relief areas; protect the summer and winter shoreline habitat for polar bears, and the summer shoreline habitat for walrus and seals; prevent loss of important bird habitat and alteration or disturbance of shoreline marshes; and prevent impacts to subsistence resources and activities.	Facilities prohibited in coastal waters designated; vessels will maintain 1-mile buffer from aggregation of hauled out seals and half-mile buffer from walruses. Consider the practicality of locating facilities that necessarily must be within this area at previously occupied sites such as various Husky/USGS drill sites and DEW Line sites. Marine vessels shall not conduct ballast transfers or discharge any matter into the marine environment within 3 miles of the coast.	Changed to Stipulation K-5. Added text: NSO. No new infrastructure, except essential coastal infrastructure (see requirement/standard for essential coastal infrastructure). The following requirements apply to authorized activities within 1 mile of the coast: – Permanent production well drill pads or a central processing facility for oil or gas would not be allowed in coastal waters or on islands between the northern boundary of the NPR-A and the mainland or in inland areas within 1 mile of the coast. Other facilities necessary for oil and gas production, such as barge landing, seawater treatment plant, or spill response staging and storage areas, would not be precluded. Nor would this stipulation preclude infrastructure associated with offshore oil and gas exploration and production or construction, renovation, or replacement of facilities on existing gravel sites. – For permanent oil and gas facility in the Coastal Area, develop and implement a monitoring plan to assess the effects of the facility and its use on coastal habitat and use.
BMP K-9[a]	(Teshekpuk Lake Caribou Movement Corridor) Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving and rearing, insect-relief, and migration) in the area extending from the eastern shore of Teshekpuk Lake eastward to the Kogru River.	Within the Caribou Movement Corridors, no permanent oil and gas facilities, except for pipelines. Prior to the permitting of permanent oil and gas infrastructure, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife and subsistence resources.	Changed to Stipulation K-10. Changes do not affect text as described.
BMP K-10[a]	(Southern Caribou Calving Area) Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving and post calving, and insect-relief), in the area south/southeast of Teshekpuk Lake.	Within the Southern Caribou Calving Area, no permanent oil and gas facilities, except pipelines or other infrastructure associated with offshore oil and gas production, will be allowed.	Changed to Stipulation K-11. No similar requirement. See Stipulation K-9 and ROP E-23.
Stipu-lation K-15	Minimize disturbance to Native subsistence hunters resulting from development and ensure access to Native allotments.	No similar requirement.	Permanent oil and gas facilities within 3 miles of Native allotments are prohibited, except for essential road and pipeline crossings in areas of overlapping setbacks. Exceptions would be granted with the permission of the owner of the allotment. In cases of overlapping setbacks, the permittee would need the permission of the primary owners of the allotments to develop within the setback. Allotment owners may not waive setbacks defined in Stipulation K-1.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
Stipulation K-16	Minimize the impact of rapid development on the communities within the NPR-A.	No similar requirement.	For alternatives B and E only: Lease tracts that are surrendered or currently unleased within the deferral area would not be offered for lease for the stated period of time after the signing of the IAP ROD. a. The Teshekpuk Lake deferral area encompasses land on the eastern edge of the NPR-A boundary and land around Teshekpuk Lake and Atigaru Point (see BLM 2020). This lease deferral is valid for 10 years. From the eastern NPR-A boundary, the deferral area includes most of the following townships: • T14N, R1E, U.M. • T14N, R1W, U.M. • T14N, R2W, U.M. • T14N, R3W, U.M. • T14N, R4W, U.M. • T15N, R8W, U.M. • T16N, R8W, U.M. • T17N, R8W, U.M. • T15N, R9W, U.M. • T16N, R9W, U.M. • T17N, R9W, U.M. For alternative B only: The deferral area around Atqasuk extends 3 miles in all directions from land owned by the Atqasuk Corporation This deferral is valid for 5 years.
BMP L-1	Protect stream banks and water quality; minimize compaction and displacement of soils; minimize the breakage, abrasion, compaction, or displacement of vegetation; protect cultural and paleontological resources; maintain populations of, and adequate habitat for birds, fish, and caribou and other terrestrial mammals; and minimize impacts to subsistence activities.	BLM may permit low-ground-pressure vehicles to travel off of gravel pads and roads during times other than those identified in BMP C-2.	Changes do not affect text as described.

LS or BMP	Description or Objective	2013 Requirement	Proposed Changes to BMPs per 2020 IAP Revisions
BMP M-1	Minimize disturbance and hindrance of wildlife, or alteration of wildlife movements through the NPR-A.	Chasing wildlife with ground vehicles is prohibited. Particular attention will be given to avoid disturbing caribou.	Added text: Permittees will submit a vehicle use plan with their permit application, that will include: – Industry practices to minimize or mitigate delays to caribou movement, vehicle collisions, or displacement during calving, spring migration, fall migration, and post-insect aggregation movement. By direction of BLM, traffic may be stopped throughout a defined area for up to 4 weeks to prevent displacement of calving caribou (alternatives B, C, and D only). – Summary of all planned off-road travel, including the number of vehicles, type, and general routes. – Strategies for complying with Stipulations K-6, K-8, K-9 and K-14, if applicable. Includes L-1, if applicable, under Alternative E. – Monitoring may be required as part of the vehicle use plan and could include collection of data on vehicle counts and vehicle interactions with wildlife. – Permittees shall provide an annual report to the BLM reporting roadkill of birds and mammals to help the BLM determine whether preventative measures on vehicle collisions are effective.
BMP M-2	Prevent the introduction, or spread, of nonnative, invasive plant species in the NPR-A.	Certify that all equipment and vehicles are weed-free prior to transporting them into the NPR-A. Monitor annually for invasive species and submit a plan detailing methods for cleaning, monitoring, and weed control.	Changes do not affect text as described.
BMP M-3	Minimize loss of populations of, and habitat for, plant species designated as Sensitive by the BLM in Alaska.	Conduct surveys at appropriate times of the summer season and in appropriate habitats for the Sensitive Plant Species.	Changes do not affect text as described. See BMP E-12 for tools to assess habitat.
BMP M-4	Minimize loss of individuals of, and habitat for, mammalian species designated as Sensitive by the BLM in Alaska.	If development is proposed in an area that provides potential habitat for the Alaska tiny shrew, the proponent would conduct surveys at appropriate times of the year and in appropriate habitats in an effort to detect the presence of the shrew.	Changes do not affect text as described. See BMP E-12 for tools to assess habitat.
BMP M-5	Minimize bare soil. Reduce areas of bare soil that can contribute to dust emission to protect human health and subsistence resources.	No similar requirement.	Alternatives B, C, D: permittees will use appropriate measures to control dust (e.g. dust palliatives and watering), as outlined in dust control plans submitted to ADEC pursuant to 18 AAC 50.045(d). All action alternatives: areas of bare soil resulting from operations will be revegetated with native species within 48 months of abandonment, unless otherwise specified in the abandonment and reclamation plan.

Source: BLM 2013, 2020

Note: µPa (micropascal); agl (above ground level); BLM (Bureau of Land Management); BMP (best management practice); dB (decibels); DEW (Distant Early Warning); EPA (U.S. Environmental Protection Agency); IAP (Integrated Activity Plan); ITR (Incidental Take Regulation); LS (lease stipulation); MMPA (Marine Mammal Protection Act); NMFS (National Marine Fisheries Service); NPR-A (National Petroleum Reserve in Alaska); NSO (no surface occupancy), ROP (required operating procedure); TCH (Teshekpuk caribou herd); USFWS (U.S. Fish and Wildlife Service); USGS (U.S. Geological Survey).

[a] Revisions to K LSs and BMPs are provided as a range of values reflecting different action alternatives in BLM 2020.

2.0 DESIGN FEATURES TO AVOID AND MINIMIZE IMPACTS

The Project proponent has incorporated measures to avoid and minimize impacts into the Project design. These are listed in Table I.1.2; the measures are part of the Project and were used to evaluate the impacts described in the Willow MDP EIS, Chapter 3.0, *Affected Environment and Environmental Consequences*. Some of these measures are similar to existing or proposed NPR-A LSs and BMPs or other requirements and are included to show the Project proponent's commitment to adhering to them. The Project proponent may propose additional measures in subsequent permitting phases.

Table I.1.2. Design Features to Avoid and Minimize Impacts

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
1	Use directional drilling to reduce the overall gravel footprint for drill site pads.	Gravel infrastructure	BMP E-5 AOGCC	All
2	Construct road surfaces to the minimum width required for Project operations to minimize the placement of gravel fill: 32-feet-wide Willow access and BT1 and BT2 roads 24-feet-wide water source access pads airstrip, BT3, BT4, and BT5, and access roads. Roads designed with a smaller top (crown) surface avoid additional fill placement where wider roads are not required.	Gravel infrastructure	BMP E-5; ADNR DMLW	All
3	Use 20-foot well spacing (instead of 30-foot well spacing) to reduce the overall gravel footprint for drill site pads.	Gravel infrastructure	BMP E-5; AOGCC; ADNR DMLW	Wetlands and vegetation
4	Share use of existing equipment and facilities (e.g., camps, seawater treatment plant, warehouses, maintenance shops, emergency response equipment) to reduce the overall Project gravel- and ice-pad footprint.	Gravel infrastructure	BMP E-5; ADEC	Water resources; wetlands and vegetation
5	Use single-season ice roads to support winter construction of gravel roads, pads, and pipelines to avoid the need for additional gravel roads for construction. This includes accessing via ice road instead of gravel.	Gravel infrastructure, mine site	ADNR DMLW	Wetlands and vegetation
6	Use 2:1 side slopes (i.e., gravel road and pad embankment slopes) instead of 3:1 to reduce the Project's overall gravel footprint.	Gravel infrastructure	BMP E-5	Wetlands and vegetation
7	Locate drill site BT4 (and associated roads and pipelines) outside of the Teshekpuk Lake Caribou Habitat area which would reduce the overall gravel footprint and eliminate the need for a bridged crossing of the Kalikpik River.	Gravel infrastructure, pipelines	BMP K-5; ADNR DMLW; ADEC; AOGCC	Wetlands and vegetation; terrestrial mammals
8	Avoid permanently flooded wetlands by locating Project infrastructure on higher, and relatively drier areas, when practicable. This practice applies to drill sites and other pads, road alignments, the new airstrip, and other project components.	Gravel infrastructure	None	Wetlands and vegetation; water resources
9	Suspend communications and power cables from horizontal support members to avoid additional fill associated with utility poles and to reduce the potential for bird strikes and perches for predators.	Utilities	BMP E-11	Wetlands and vegetation; birds
10	Use ice roads and pads, including multi-season ice pads, to support Project construction, including using ice pads to house construction camps; stage construction equipment; allow stockpiling of gravel and mine site overburden during construction activities; and support construction activities at bridge crossings, along the Project's pipeline alignment, at the HDD crossing of the Colville River, and at other locations as needed near the proposed infrastructure.	Construction activity	BMP E-5; ADEC; ADNR DMLW	All
11	Design pipelines to minimize redundant parallel pipelines to the extent practicable. (For example, infield pipelines from drill site BT4 would connect to drill site BT2 infield pipelines at BT2; the drill site BT2 infield pipelines would then tie into drill site BT1 pipelines at BT1; and then drill site BT1 infield pipelines would connect with the WPF. Additionally, the Willow export pipeline would tie into the existing Alpine Sales oil pipeline at a tie-in pad near Alpine CD4N to connect the Project to the Trans-Alaskan Pipeline System.)	Pipelines	BMP E-7; AOGCC; ADEC	Wetlands and vegetation; birds; terrestrial mammals; spill risk

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
12	Colocate the WPF with drill site BT3 to eliminate the need for an additional gravel pad and associated gravel fill (Alternative D only).	Gravel infrastructure	BMP E-5; AOGCC	Wetlands and vegetation
13	Construct oil and gas facilities and other Project infrastructure more than 500 feet from fish-bearing waterbodies, to the maximum extent practicable. Only essential pipeline road crossings are proposed for the Project that would encroach on this minimum distance. (For example, the intersection between the BT1 and BT3 access roads was realigned and shifted west to locate the BT1 road outside of the 500-foot buffer of swale 2, an anadromous waterbody.) Construction camps would not be sited on frozen lakes or rivers. (Anticipated deviations are noted in the EIS.)	Gravel infrastructure, pipelines	LS E-2; ADF&G; ADEC; ADNR DMLW	Water resources; fish
14	Consult with appropriate federal, state, and NSB agencies regarding the mine site design and reclamation plan. Design mine site to minimize impacts to wildlife, air quality, and water resources. Mine site operation and reclamation would include the storage and reuse of organic overburden (for the mine sites). Site the mine pits outside of the active floodplain to minimize impacts to water resources.	Gravel source	BMP E-8; ADF&G; ADEC; NSB; ADNR DMLW	Soils, permafrost, and gravel resources; visual resources; water resources; wetlands and vegetation; fish; birds; subsistence and sociocultural systems
15	While mine site is in use, do not discharge reserve pit fluids to surface waters or lands.	Waste management	BMP A-6; ADF&G; ADEC	Water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems; public health
16	Design, construct, maintain, and operate roads in ways to minimize environmental impacts and protect subsistence use areas and access. Gravel road alignments and pad layouts would consider topography, maintenance of natural drainage patterns, and the effects of spring breakup and other potential flood events. Road and pad layouts would also avoid ponds, lakes, and streams to the extent practicable.	Gravel infrastructure	BMP E-1; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; subsistence and sociocultural systems
17	Restrict summer tundra vehicle travel for Project personnel to emergency response or to permitted activities required by statute or regulation.	Personnel	BMP L-1; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
18	Use low-angle approaches for ice road waterway crossings to protect streambanks. Waterway crossings reinforced with additional snow or ice (“bridges”) would be removed, breached, or slotted prior to spring breakup to maintain normal spring runoff patterns and fish passage. All constructed ice ramps and ice bridges would be substantially free of debris (e.g., sticks, brush).	Ice infrastructure	BMP C-3; ADF&G; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; fish; terrestrial mammals; marine mammals
19	Prohibit travel along streambeds unless it can be demonstrated that there would be no additional impacts from such travel to over-wintering fish or the invertebrates they rely on. Rivers, streams, and lakes would only be crossed with ice infrastructure at areas where waterbody or waterway ice has grounded, when practicable.	Ice infrastructure	BMP C-4; ADF&G; ADEC; ADNR DMLW	Water resources; fish
20	Inject produced water into the reservoir and do not discharge it to surface lands, surface waters, or marine waters.	Waste management	BMP A-7; ADF&G; ADEC	Water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems; public health

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
21	Use recent ecological mapping to assess wildlife habitat types to inform the design, placement, and development of permanent (i.e., gravel) infrastructure.	Gravel infrastructure	BMP E-12; ADF&G	Wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals
22	Remove, slot, breach, or score ice road stream crossings prior to spring breakup to ensure adequate flow and drainage conditions at stream crossings.	Ice infrastructure	LSs K-1 and K-2; BMPs C-3 and E-6; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds
23	Place gravel roads perpendicular to the general flow direction when crossing natural drainages to maintain the existing flow patterns and characteristics.	Gravel infrastructure	LSs K-1 and K-2; ADNR DMLW; ADF&G	Water resources; wetlands and vegetation; fish; birds
24	Design and construct stream and swale crossings to ensure the free passage of fish, minimization of erosion, maintenance of natural drainage characteristics, and the minimization of impacts to natural stream flow. Bridges would be used to cross rivers and major streams.	Gravel infrastructure	BMP E-6; ADF&G; ADNR DMLW	Water resources; wetlands and vegetation; fish; birds
25	Design fish-passage culverts in consultation with the Alaska Department of Fish and Game.	Gravel infrastructure	ADF&G; ADEC	Fish
26	Install cross-drainage culverts as needed to maintain natural surface drainage to mitigate the risk of sheet flow interruption and thermokarsting. The estimated spacing of culverts is approximately every 1,000 feet. (Exact placement would be adjusted based on a field survey of in-field local drainage patterns.)	Construction	BMPs E-6, K-1, and K-2; ADF&G	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; birds
27	Place bridges and river crossings at narrow river sections, where practicable, to avoid gravel fill and minimize the number of piers/pilings placed below ordinary high water.	Gravel infrastructure	ADF&G	Water resources; wetlands and vegetation; fish
28	Construct bridge abutments from sheet pile to reduce the overall gravel footprint and protect the structures from embankment erosion and stream scour.	Construction	BMP E-5; ADF&G; ADEC	Soils, permafrost, and gravel resources; water resources; fish
29	Do not stockpile gravel in Waters of the U.S., including wetlands. Gravel would be stockpiled in upland areas or on ice pads.	Gravel infrastructure	ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; birds
30	Install vertical support members (for pipelines) from ice roads and pads, and ensure drill cuttings are temporarily stored on ice and removed to the gravel mine site prior to spring breakup.	Construction	AOGCC; ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
31	Conduct trenching activity (e.g., pipeline road crossings) during winter and temporarily store trench materials on plywood, plastic sheeting, or an ice pad to avoid additional impacts to wetlands (e.g., fill).	Construction	ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
32	Minimize heat transfer and impacts to permafrost from Project infrastructure on gravel pads by: designing flare stack height to reduce radiant heating; filling the gap between well conductors and inner pipes with polyurethane foam; using thermosyphons adjacent to well rows and at-grade structures; and installing insulation below the foundation floors of heated, at-grade structures.	Construction and operations	ADEC; ADNR	Soils, permafrost, and gravel resources
33	Elevate on-pad heated buildings or structures using pilings, to the extent practicable, to prevent or reduce heat transfer to underlying soils and preserve the thermal integrity of the permafrost.	Facilities	ADEC	Soils, permafrost, and gravel resources

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
34	Implement snow removal management measures to reduce the potential for gravel to be pushed off roads and pads during snow removal operations.	Construction and operations	ADNR DMLW	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
35	Implement dust control measures for gravel roads, pads, and mining operations to reduce fugitive dust that can settle on vegetation or snow, which could increase thermal conductivity (i.e., reduce albedo), lead to thermokarsting, and promote earlier spring thaw in affected areas.	Gravel infrastructure	BMP A-10; ADEC	Soils, permafrost, and gravel resources; air quality; visual resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; public health
36	Implement strict guidelines for travel on ice roads to avoid tundra damage, including requiring ice road driver training, establishing speed and weight limits, and installing road-edge delineators along both sides of roads.	Tundra travel	ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; wetlands and vegetation; birds; terrestrial mammals
37	Install Colville River pipeline crossings (e.g., diesel, seawater) with insulation and placed within an outer pipeline casing, which would inhibit heat transfer to permafrost, contain fluids in the event of a pipeline leak, and provide structural integrity to the pipeline crossing.	Pipelines	ADEC	Soils, permafrost, and gravel resources; Water resources; Spill risk
38	Design, construct, and use ice roads that are a minimum of 6 inches thick during winter construction to eliminate or minimize impacts to wetlands and tundra.	Ice infrastructure	BMPs C-2, E-1, K-1, M-2, and M-3; ADF&G; ADNR DMLW	Soils, permafrost, and gravel resources; wetlands and vegetation; birds; terrestrial mammals
39	Implement an erosion control plan to detail ways the Project would prevent or mitigate erosion that could impact terrestrial and aquatic environments. The plan would include CPAI's operations, monitoring, and maintenance procedures that detail the actions CPAI would undertake to monitor, maintain, and if needed, remediate gravel fill impacting surrounding tundra and wetlands.	Erosion control	BMPs C-2, C-3, C-4, E-1, E-3, E-6, E-8, I-1, K-1, K-2, M-2, and M-3; ADF&G; ADEC; ADNR DMLW	Soils, permafrost, and gravel resources; visual resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
40	Place cleared (i.e., plowed) snow in designated snow-storage areas and manage stormwater from all gravel pads to prevent contaminants from being released during spring breakup. Select snow push areas annually based on avoiding areas of thermokarsting, proximity to waterbodies, and evaluations of areas used the previous year.	Snow management	BMPs A-3, A-4, A-5, A-12, E- 1, K-1, M-2, and M-3; ADNR; ADEC	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation
41	Use a minimum of 5-foot-thick section for gravel pads and roads to maintain a stable thermal regime by insulating the underlying tundra and offsetting the loss of insulating effect caused by the compression of the vegetated tundra beneath the gravel.	Gravel infrastructure	BMP E-5; ADNR DMLW	Soils, permafrost, and gravel resources
42	Route ice roads to avoid shrub areas and large areas of tussock tundra to the extent practicable.	Ice infrastructure	BMPs C-2, E-1, K-1, M-2, and M-3; ADF&G; ADNR DMLW	Wetlands and vegetation; birds; terrestrial mammals

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
43	Construct pipelines above ground, to the extent practicable, to minimize permafrost impacts.	Pipelines	BMPs A-3, A-4, A-5, and E-4; ADEC; ADNR	Soils, permafrost, and gravel resources
44	On BLM-managed lands, withdraw unfrozen water from lakes and not rivers and streams during winter to maintain populations of, and adequate habitat for, fish and invertebrates. Ice aggregate would not be removed from areas of grounded ice less than or equal to 4 feet in depth (on BLM-managed lands) without authorization from the BLM, on a site-specific basis.	Water withdrawal	BMP B-1; ADNR DMLW; ADEC	Water resources; fish
45	Do not construct causeways or docks in any river mouth or delta. Causeways, docks, artificial islands, or other bottom-fast structures, if employed, would be designed to ensure free passage of fish and prevent changes to water circulation patterns or water quality.	Gravel infrastructure	BMP E-3; ADNR DMLW; ADF&G	Water resources; fish; birds
46	Maintain air-traffic altitudes consistent with NPR-A BMP F-1 except during takeoffs and landings, and unless doing so would endanger human life or violate safe flying practices, to avoid disturbing caribou, birds, and subsistence users, when feasible. (Some air traffic would be required to support the Project or for regulatory compliance [e.g., wildlife studies, hydrology studies] and to ensure cleanup following the ice-road season could require flying at lower altitudes.)	Air traffic	BMP F-1; ADF&G	Noise; visual resources; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
47	Develop a bear-interaction plan for Project personnel to minimize conflicts between bears and humans.	All	BMP A-8; ADF&G	Terrestrial mammals; marine mammals
48	Minimize disruption to caribou movement by maintaining a minimum clearance of 7 feet between the bottom of pipelines and the ground surface.	Pipelines	BMP E-7; ADF&G; ADEC	Terrestrial mammals; subsistence and sociocultural systems; spill risk
49	Design facilities to minimize nesting, denning, or sheltering opportunities for ravens, raptors, and foxes. Prohibit intentional feeding of wildlife.	Facilities	BMP E-9; ADF&G	Birds; terrestrial mammals
50	Implement a Project lighting plan that would include measures to minimize the amount of light visible from outside of facilities, including directing artificial exterior lighting inward and downward from August 1 to October 31, which would prevent waterfowl (including species listed under the ESA) from striking facilities during low light conditions.	Facility lighting	BMP E-10; typical ESA conservation measure; ADF&G	Birds
51	Minimize the take of species, particularly those listed under the ESA and BLM Special Status Species, by conducting eider and yellow-billed loon surveys and working with resource agencies to ensure facilities minimize impacts to species found (e.g., ensure off-pad utility lines are either buried or suspended from pipe racks to the extent feasible, locate towers on pads near existing buildings to the extent feasible, minimize the use of tower guy wires, clearly mark guy wires that are used to prevent collisions).	Facilities	BMP E-11; typical ESA conservation measure; ADF&G	Birds
52	Develop a new gravel mine site that would not result in the loss of raptor nesting habitat because it would not take gravel from cliffs, river channels, or stream channels in a manner that would affect river bluffs.	Gravel source	BMP E-15; ADF&G	Birds

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
53	Minimize the electrocution hazard by suspending electrical distribution lines from pipe racks or burying cables (versus the use of overhead power lines) off pad.	Utilities	BMP E-16; typical ESA conservation measure; ADF&G	Birds
54	Provide the BLM authorized officer with GIS-compatible location information to facilitate agency monitoring and assessment of wildlife movements through the Project area after Project construction.	Facilities	BMP E-19; ADF&G	Birds; terrestrial mammals
55	Locate pipelines parallel to new and existing gravel roads and maintain a minimum separation distance of 500 feet, where feasible, to minimize caribou disturbance and prevent excessive snow accumulation from snowdrifts and snow removal.	Pipelines	BMP E-7; ADF&G	Terrestrial mammals; spill risk
56	Contract with a state-registered Primary Response Action Contractor to assist with quick spill response impacts in the event of a spill.	Operations	BMPs A-8, C-1, F-1, I-1, and M-1; ADEC	Spill risk
57	Align pipe racks installed adjacent and parallel to existing pipeline racks so vertical support members for each pipe rack are in line, to the extent practicable, to reduce obstructions to caribou and subsistence user movements.	Pipelines	BMPs E-4 and E-7; ADEC	Birds; terrestrial mammals; subsistence and sociocultural systems
58	Use a muted (i.e., non-reflective) coating on pipelines to avoid glare.	Pipelines	BMPs E-4, E-7, and M-1; ADEC	Visual resources; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
59	Implement policies, procedures, and training to prevent wildlife attraction to Project facilities, including use of predator-proof dumpsters for food waste collection; a strict policy prohibiting the feeding of wildlife; and the use of Ziploc bags or other sealed containers for meals-on-the-go to conceal food odors.	Waste management and wildlife interaction	BMPs A-8, I-1, and M-1; ADEC	Birds; terrestrial mammals; marine mammals
60	Implement a Wildlife Avoidance and Interaction Plan that would include procedures to eliminate, minimize, and mitigate bear interactions. CPAI conducts training on waste management practices and would conduct Project-specific training on waste management to guide employees and contractors on managing predators.	Waste management	BMPs A-1, A-2, A-8, C-1, I-1, and M-1; typical ESA conservation measure; ADF&G; ADNR; ADEC	Birds; terrestrial mammals; marine mammals
61	Protect grizzly and polar bear denning sites by prohibiting cross-country travel or use of heavy equipment within 0.5 mile of a grizzly bear den and within 1.0 mile of a polar bear den. Where necessary, CPAI would conduct surveys near coastal areas to locate potential polar bear dens, in consultation with the U.S. Fish and Wildlife Service, as appropriate, before initiating activities in coastal habitat between October 30 and April 15.	All	BMP C-1; typical ESA conservation measure; ADF&G; ADNR DMLW	Terrestrial mammals; marine mammals
62	Conduct training for Project personnel on NPR-A BMPs, standards, and environmental, social, traditional, and cultural concerns specific to the Project region, including training on community interactions. This training would be designed to ensure strict compliance with local and corporate drug and alcohol policies.	Personnel	BMP I-1; NSB	Subsistence and sociocultural systems; cultural resources

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
63	Prohibit Project employees from hunting and trapping activities while employees are on active work status to avoid increased competition for subsistence and recreational wildlife resources.	Personnel	BMP H-3 ADF&G	Subsistence and sociocultural systems
64	Use the results of cultural and paleontological resource surveys to inform project design and facilities placement. The Project would avoid known cultural and paleontological resources during ground-disturbing activities, including the construction of ice roads.	Construction	BMP E-13; ADNR	Cultural and paleontological resources
65	Implement a Visual Resources Management Plan to minimize visual resource impacts, consistent with the Visual Resources Management Class for the lands on which Project facilities would be located.	Project infrastructure	BMP E-17; ADNR	Visual resources
66	Avoid disturbance of caribou and strictly prohibit chasing wildlife with vehicles.	Personnel	BMP M-1; ADF&G	Birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
67	Continue to consult with affected subsistence communities, tribes, Alaska Native Corporations, and the NSB, as well as the Kuukpikmuit Subsistence Oversight Panel, Alaska Eskimo Whaling Commission, Nuiqsut Whaling Captains, and Barrow Whaling Captains to mitigate potential impacts to subsistence activities. Plans would be maintained to ensure these consultations continue both periodically and robustly.	All	BMP H-1; NSB	Subsistence and sociocultural systems
68	Continue to consult with the Kuukpik Subsistence Oversight Panel, the Native Village of Nuiqsut, and Kuukpik Corporation to ensure Project activities do not adversely affect subsistence activities. CPAI would continue to hold frequent public community meetings well in advance of future activities. Travel would be scheduled with flexibility and managed through the use of speed limits, rerouting, and traffic stoppages to avoid conflict with subsistence use and hunting areas during seasonal periods.	All	BMPs A-11, A-12, E-1, E-7, F- 1, H-1, H-3, I-1, K-1, K-2, and M-1; NSB	Subsistence and sociocultural systems
69	Continue to provide annual funding for Kuukpik Subsistence Oversight Panel to help support the executive director and coordinate panel activities.	All	BMPs A-11, A-12, E-1, E-7, F- 1, H-1, H-3, I-1, K-1, K-2, and M-1; NSB	Subsistence and sociocultural systems
70	Conduct high-disturbance construction activities such as gravel mining and placement, and pipeline and facility construction, primarily during the winter months when subsistence activity levels are relatively low and disruptions to water flow can be minimized.	Construction	LSs K-1 and K-2; BMP E-6; ADF&G	Water resources; fish; birds; terrestrial mammals; subsistence and sociocultural systems
71	Include subsistence tundra access ramps and pullouts on gravel roads with locations based on community input. The pullouts would allow local residents to access the areas adjacent to roadways. The tundra access ramp and pullouts would be designed with considerations of lessons learned from the Greater Mooses Tooth 1 and 2 projects.	Gravel infrastructure	ADNR DMLW; NSB	Subsistence and sociocultural systems
72	Prohibit the use of airboats on rivers within BLM-managed lands and within a 50-mile radius of Nuiqsut, except for emergencies and emergency response training.	Operations	BMPs E-1, E-7, H-3, I-1, K-1, K-2, and M-1; ADNR DMLW; ADF&G	Noise; birds; fish; terrestrial mammals; marine mammals; subsistence and sociocultural systems
73	Continue the internship program (CareerQuest) to introduce Nuiqsut high school students to jobs and careers in the oil fields and in their community.	Community outreach	NSB	Economics; subsistence and sociocultural systems

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
74	Continue to strive to hire qualified Nuiqsut, NSB, and Alaska residents for oil field jobs.	Personnel	NSB	Economics
75	Ensure current communications protocols for CPAI helicopter, fixed-wing aircraft, and marine-vessel traffic are adequate to address community (Nuiqsut) concerns about traffic-related impacts to subsistence activities.	Air and vessel traffic	BMPs E-1, E-7, F-1, H-1, H-3, I 1, K-1, K-2, and M-1; NSB	Subsistence and sociocultural systems
76	Allow Nuiqsut residents reasonable use of Project roads to access subsistence areas throughout the life of the Project.	Gravel infrastructure	BMPs E-1, E-7, H-1, H-3, I-1, K-1, K-2, and M-1; NSB; ADNR DMLW	Subsistence and sociocultural systems
77	Implement avoidance measures to ensure protection of cultural resource sites during Project activity by establishing a 500-foot avoidance buffer consistent with NSB regulations.	All	NSB	Cultural resources
78	Reduce and minimize air pollution through air quality monitoring and modeling, as appropriate. Develop an emissions inventory and apply additional mitigation measures and activity modifications, as appropriate, in response to the air quality information generated. Make reports generally available to the NSB and local communities.	Air emissions	BMP A-10; ADEC; NSB	Air quality; public health
79	Adhere to the BLM's oil and gas air resources BMPs, as applicable. These practices would minimize air emissions resulting from both Project construction and operations and would include: watering gravel roads to minimize fugitive dust, using clean fuels such as ultra-low sulfur diesel and natural gas, and the use of low emissions emitting equipment (including maximum use of electrical power, Tier IV final engines - or similar emission reduction technology for drill rigs and hydraulic fracturing equipment prior to WCF facility startup - storage tank closed vent systems to the extent practicable, and green completions).	All	ADEC	Air quality; water resources; wetlands and vegetation; public health
80	Use ultra-low sulfur diesel fuel (as defined by the Alaska Department of Environmental Conservation) in all diesel-fueled vehicles and equipment.	Vehicles and equipment	BMP A-9; ADEC	Air quality; public health
81	Use totally enclosed or acoustically packaged permanent electric power generator sets to abate noise.	Generators	ADEC	Noise; birds; terrestrial mammals; marine mammals
82	Generate Project power using the power plant at the WPF following facility startup and provide power to drill rigs except during periods when power from the WPF is unavailable. Use ultra-low-sulfur diesel powered portable generators to supply Project power prior to facility startup or during periods of facility maintenance, shutdown, or upsets.	Utilities	BMP A-10; ADEC; AOGCC	Air quality; public health
83	Power off vehicles and heavy equipment (i.e., rolling stock) used for oil and gas operations when not in active use, to the extent practicable.	Vehicles	BMPs A-10 and E-1; ADEC	Air quality; public health
84	Equip vehicles with block heaters and institute Project practices to power off and plug in vehicle engines when temperatures are -30°F or above to conserve fuel and reduce emissions.	Vehicles	BMPs A-10 and E-1; ADEC	Air quality; public health
85	Use Finewater Mist for process module fire protection and a non-ozone depleting agent for drill site and non-process module fire protection in lieu of Halon.	Fire protection	BMPs A-10 and E-1; ADEC	Air quality; water quality

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
86	Manage all waste in accordance with a comprehensive waste management plan to reduce impacts to human health and safety and to minimize potential effects to subsistence resources, including fish and wildlife. This would be accomplished using the Alaska Waste Disposal and Reuse Guide (the "Red Book"). This guide addresses: waste prevention and reduction, recycling, treatment, and disposal. The waste management plan would include measures to avoid attracting wildlife, disposal of putrescible waste, disposal of pumpable waste, and disposal of wastewater. As allowed, injectable waste would be injected into the subsurface via disposal wells or used for enhanced oil recovery.	Waste management	BMP A-2; ADEC	Water resources; wetlands and vegetation; birds; terrestrial mammals; marine mammals; subsistence and sociocultural systems
87	Audit contractors' health, safety, and environment performance to ensure safe practices are followed.	Personnel	BMPs A-2, A-3, A-4, and A-5; ADEC	Water resources wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; subsistence; public health
88	Audit the Project on a scheduled basis to ensure compliance with all environmental laws, regulations, and local requirements, company policies and procedures, and other regulations regarding safety, land use, fire codes, etc.	All	ADNR DMLW; ADEC	All
89	Employ Field Environmental Coordinators to monitor compliance with permits and other Project requirements.	All	ADNR	All
90	Evaluate environmental considerations when purchasing new storage tanks or adding new emissions sources that may affect the environment or operating permits.	All	BMPs A-10 and E-1; ADEC	All
91	Review new chemicals being considered for use on the Project to ensure the materials would minimize the generation of hazardous waste or risk to employees.	Operations	BMPs A-2, A-3, A-4, and A-5; ADEC	All
92	Develop and implement a spill prevention and response contingency plan for the Project (in accordance with 40 CFR 112) to reduce impacts to human health and safety and to minimize potential effects to subsistence resources, including fish and wildlife. The Plan would cover Project operations and describe spill prevention measures and on-site cleanup materials for permanent fueling stations, use of proper storage containers and liner materials, proper container identification, and notice of reportable spills. Identification of drip pans (i.e., "duck ponds") would be addressed through Project operating procedures.	Spill prevention and response	BMP A-4; ADEC	All
93	Use a hazardous materials contingency plan (also known as a spill prevention and response contingency plan), prepared pursuant to NPR-A BMP A-3, that would detail response actions, drills, and responder training.	Spill prevention and response	BMP A-3; ADEC	All
94	Build and operate pipelines with the best available technology for detecting and preventing corrosion or mechanical defects to minimize impacts related to point source pollution from oil spills or leaks.	Pipelines	BMP E-4; ADEC	All

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
95	Install pipeline valves on each side of Judy (Kayyaak) and Fish (Uvlutuuq) creek crossings, to allow isolation of produced fluids pipelines on either side of bridges and minimize potential spill impacts in the event of a leak or break. These valves would reduce subsistence user concerns related to downstream contamination from the Project. Isolation valves or vertical loops would be installed on the Willow (sales oil) pipeline at each side of the and on each side of the segment crossing the Nigliagvik Channel, Nigliq Channel, and lakes L9341 and L9323. Vertical loops would be installed on the diesel pipeline at each side of the Miluveach River, Kachemach River, and Colville River. Two methods of leak detection will be used for the seawater and diesel pipeline crossings under the Colville River: (1) leak detection mass balance (primary), and (2) optical leak detection (secondary, within casing).	Pipelines	ADEC	All
96	Implement CPAI's "Target Zero" spill prevention program, which is designed to raise awareness around spill prevention and pass on lessons learned, for the Project.	Spill prevention and response	BMPs A-3, A-4, and A-5; ADEC	All
97	Implement a fuel transfer standard operating procedure and use secondary containment on regulated oil and hazardous materials storage tanks.	Spill prevention and response	BMPs A-3, A-4, and A-5; ADEC	All
98	Continue to implement an extensive corrosion inspection program which includes ultrasonic inspection, radiographic inspection, coupon monitoring, metal loss detection pigs and geometry pigs (applicable to pig-capable pipelines), and infrared (heat signature detection) technology. The inspection programs are American Petroleum Institute Standard 570-based programs that focus inspection efforts on areas of greatest potential for spills.	Spill prevention and response	BMPs A-3, A-4, and A-5; ADEC	All
99	Continue CPAI's operating practice to immediately and completely clean up all spills, recovering 100% of spilled material for recycling when possible.	Spill prevention and response	BMPs A-3, A-4, A-5, and A-12; ADEC	All
100	Periodically treat pipeline fluids, as appropriate to product types, with chemicals to limit corrosion potential.	Pipelines	LS K-1; BMPs A-3, A-4, A-5, and E-4; ADEC	All
101	Equip and maintain oil spill response equipment intended for use in winter conditions for effective use in Arctic conditions (i.e., in a manner to prevent the freezing or icing of the equipment).	Spill prevention and response	BMPs A-3, A-4, and A-5; ADEC	All
102	Hydrostatically test pipelines prior to placing them into operation.	Pipelines	BMPs A-3, A-4, A-5, and E-4; ADEC	All
103	Provide access to the GMT-2 and Alpine developments (under Alternatives B and C) to offer additional response capabilities and minimize response time in the event of a spill or other unintended release or emergency.	Spill prevention and response	BMPs A-3, A-4, A-5, and A-12	All
104	Stage spill response equipment in strategic locations (e.g., drill sites) for initial spill response. On-site staged equipment would facilitate the rapid deployment of response personnel and may minimize or reduce the overall impacts associated with a spill or other accidental release.	Spill prevention and response	BMPs A-3, A-4, A-5, and A-12; ADEC	All

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
105	Designate Spill Response Teams and Hazardous Materials Response Teams, consisting of trained volunteer spill and hazardous materials response personnel on site.	Spill prevention and response	BMPs A-3, A-4, A-5, and A-12; ADEC	All
106	Continue to participate in the Mutual Aid Agreement among North Slope operators to supply labor and equipment for immediate spill response. Spill response drills and exercises would ensure response readiness and awareness; these drills would be scheduled according to the National Preparedness and Response Exercise Program guidelines and typically involves production, drilling, or pipeline spill response scenarios	Spill prevention and response	BMPs A-3, A-4, A-5, and A-12; ADEC; NSB	All
107	Do not refuel equipment within 500 feet of the active floodplain of any waterbody unless approved by the BLM authorized officer. Fuel-storage stations, except as approved by the BLM authorized officer, would be located at least 500 feet from waterbodies except for small caches (up to 210 gallons) for fueling motor boats, float planes, and small equipment.	Spill prevention and response	BMP A-5; ADNR DMLW; ADEC	All
108	Design well cellars to contain fluid drips and leaks.	Spill prevention and response	BMPs A-3, A-4, and A-5; ADEC	All
109	Continue philanthropy programs from local oil fields to provide income and other benefits to the residents of Nuiqsut.	All	None	Economics; sociocultural systems; public health
110	Design all bridges to maintain bottom chord clearance of at least 4 feet above the 100-year design flood elevation, or at least 3 feet above the highest documented flood elevation, whichever is higher. Additionally, design the Judy Creek and Fish Creek bridges to maintain bottom chord clearance of at least 13 feet above the 2-year design flood elevation (open water) to provide vessel clearance.	Bridges	None	Soils, permafrost, and gravel resources; water resources; wetlands and vegetation; fish; birds; terrestrial mammals; marine mammals; Subsistence and sociocultural systems; public health
111	Include construction of up to three subsistence boat ramps to provide local residents with improved river existing GMT-1 access road, Judy Creek at the proposed Willow BT1 access road crossing, and Fish Creek at the proposed BT4 access road crossing.	All	ROP E-1	Subsistence and sociocultural systems; public health
112	Implement a speed limit of 35 mph and stop traffic when caribou are crossing the road on all 32-foot-wide (surface width) roads. On roads with a 24-foot-wide surface width, implement a 25 mph speed limit for health, safety, and environmental purposes, including to reduce potential impacts to vegetation from dust and to wildlife.	Gravel infrastructure	None	All
113	Build a constructed freshwater reservoir to ensure a reliable source of fresh water for the Project while minimizing the need for water withdrawals from Willow-area lakes. Adaptively manage water levels by installing a flow control gate and valve to allow reduction of flow velocity into the reservoir based on monitoring of water levels in Lake M0015 and the lake outlet into Willow Creek if necessary.	Water withdrawal	None	water resources; wetlands and vegetation; fish; birds
114	Place pipelines at Fish Creek and Judy Creek on structural steel supports attached to the bridge girders below the bridge deck to avoid placement of pipeline VSMs below OHW.	Pipelines	BMP K-1	water resources; fish; birds
115	Remove the airstrip approach lighting access and secondary access roads from the proposed Project design to reduce the gravel footprint.	Gravel infrastructure	BMP-E-5	All

No.	Measure	Project Component or Activity	LS, BMP, or Other Stipulation[a]	Primary Affected Resource or Subject
116	Develop a module delivery option that uses the existing Oliktok Dock and staging pad to avoid the need to construct an MTI.	Gravel infrastructure, module delivery	BMP-E-5	All
117	Minimize the footprint of the gravel mine based on amount of gravel needed (i.e. less gravel needed for Option 3).	Gravel infrastructure, mine site	BMP-E-5	All

Note: °F (degrees Fahrenheit); ADEC (Alaska Department of Environmental Conservation); ADF&G (Alaska Department of Fish and Game); ADNR (Alaska Department of Natural Resources); AOGCC (Alaska Oil and Gas Conservation Commission); BLM (Bureau of Land Management); BMP (best management practice); BT1 (Bear Tooth 1 drill site); BT2 (Bear Tooth 2 drill site); BT3 (Bear Tooth 3 drill site); BT4 (Bear Tooth 4 drill site); BT5 (Bear Tooth 5 drill site); CPAI (ConocoPhillips Alaska, Inc.); DMLW (Division of Mining, Land, Water); EIS (Environmental Impact Statement); ESA (Endangered Species Act); GIS (geographic information system); GMT-1 (Greater Mooses Tooth 1); GMT-2 (Greater Mooses Tooth 2); HDD (horizontal directional drilling); LS (lease stipulation); mph (miles per hour); MTI (module transfer island); No. (number); NPR-A (National Petroleum Reserve in Alaska); NSB (North Slope Borough); OHW (ordinary high water); ROP (required operating procedure); VSM (vertical support member); WPF (Willow Processing Facility). All cited lease stipulations and best management practices are from the National Petroleum Reserve in Alaska Integrated Activity Plan/Environmental Impact Statement Record of Decision (BLM 2013).

[a] Other stipulations include typical State of Alaska or NSB permit stipulations for North Slope activities or typical ESA conservation measures or BMPs. The table lists the agency from which the typical stipulation would arise.

3.0 ADDITIONAL SUGGESTED AVOIDANCE, MINIMIZATION, OR MITIGATION

In addition to Project design features, LSs, and BMPs already applicable to the Project, the EIS also considers additional suggested avoidance, minimization, and mitigation measures designed to further reduce or compensate for impacts from the Project. These measures are discussed in the relevant resource sections in the Willow MDP EIS, Chapter 3.0, *Affected Environment and Environmental Consequences*, and are summarized in Table I.1.3. They were developed based on suggestions from cooperating agencies, stakeholders, public comments, and BLM staff. The decision whether to adopt each new measure will be made in the BLM's Willow MDP ROD.

Table I.1.3. Additional Suggested Avoidance, Minimization, or Mitigation

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.2 – Climate and Climate Change	None
3.3 – Air Quality	Implement a Fugitive Dust Control Plan to mitigate impacts from fugitive PM emissions from the Project. This plan would require regular watering of pads and unpaved roads, enforcing speed limits on unpaved access and haul roads, and several other measures to reduce fugitive dust emissions and impacts. See Appendix I.3, *Dust Control Plan*, for additional details. (Though ROP M-5 requires a dust plan for areas of bare soil, it is focused on construction and mining; the Fugitive Dust Control Plan is focused on gravel roads and pads.)
3.4 – Soils, Permafrost, and Gravel Resources	Use the following in design of roads and embankments: Separate native soils from Project fill materials using geotextiles or fabrics Use thick embankments and shallow slopes Monitor thermokarsting, depth of active layer, and compression of soil and vegetation in annual resupply ice road footprint, for footprints that are used consecutively each year
3.5 – Contaminated Sites	None
3.6 – Noise	Alter flight paths to avoid sensitive areas (such as Nuiqsut) Limit blasting to the hours of 10 a.m. to 8 p.m.
3.7 – Visual Resources	Include the following in the plan to minimize visual impacts (plan is required as per BMP E-17): Ensure structures are a color that blends in with the background colors of the natural landscape. All colors would be pre-approved by the BLM. ROP E-7 and CPAI's design measure 58 (Appendix I.1, Table I.1.2) state that a non-reflective coating would be used on pipelines; that could be expanded to all metal structures not otherwise painted, including but not limited to communications towers and drill rigs. Minimize light visible from outside of Project facilities *at all times of the year* by using lighting fixtures with lamps contained within the reflector and shading externally facing windows on buildings. This will minimize impacts on visual aesthetics (i.e., reduce contrast from glare and artificial lighting).

3.8 – Water Resources	Appendix E.8 provides detail about culvert, bridge, and pipeline design and how that influences potential effects to water resources. Additional suggested measures to reduce impacts created by culvert, bridge, and pipeline crossings, could include: Unless a more appropriate method is available, when estimating flood-peak discharge at locations within the s, use a weighted average from a single station analysis of the BLM long-term monitoring station data on each of these streams and the Shell regression equations (Appendix E.8). Weight the results of the two computations based on the uncertainty associated with each estimate. As appropriate, consider both 1) snow- and ice-impacted conditions and 2) ice-free conditions in the hydraulic design of bridges, culverts, and pipeline river crossings. Cross-section data at the time of the peak stage and peak discharge that are available for many rivers and streams indicate that the WSE was affected by snow and/or ice blockage. Based on the available information, develop designs that would perform satisfactorily during the design event considering both the possibility of open water conditions and the possibility that snow and ice blockage is occurring at the time of the design event. At a minimum, the magnitude of the blockage used in the designs should be similar to the magnitude of the blockage that has been observed. At a minimum, design culverts to perform satisfactorily for all flood events up to and including the 50-year event. The headwater-to-diameter ratio at the maximum design condition should be no greater than 1.0. Identify the locations requiring cross-drainage culverts during spring breakup prior to construction, by noting all locations where water is flowing over the proposed alignment. This is necessary because it is often not possible to determine where water flowing in polygon troughs will cross the alignment during a summer or fall inspection. At the same time, identify the ends of the proposed culverts and the invert elevation of the ends of the culvert in order to maintain the flow in the historic flow path. At a minimum, design road bridges to pass the 50-year flood-peak discharge with a minimum of a 3-foot freeboard (assuming snow and ice conditions have been considered in estimating the design water surface elevation). Design for bridge foundation scour equal to the maximum scour depth produced by floods up through a magnitude equal to the 100-year flood event, and a geotechnical design practice safety factor of from 2 to 3. Check the bridge design using a superflood and a geotechnical design practice safety factor of 1. The superflood is defined as the 500-year event, 1.7 times the magnitude of the 100-year event, or the overtopping flood, whichever is the least. These are standard criteria used by Alaska Department of Transportation and Public Facilities for bridges on the North Slope in non-designated flood hazard areas. At a minimum, design pipeline river-crossings to perform satisfactorily for all floods up to and including the 200-year event (including crossings on bridges or VSM). This is the magnitude of the design event that has typically been used for common carrier pipelines on the North Slope and a higher level of design than is being proposed for the Project. Start bridge and culvert hydraulic computations sufficiently downstream so that the downstream boundary assumptions do not affect the performance of the proposed design. Consider the USACE (1986) report "Accuracy of Computed Water Surface Profiles" in determining the location of the downstream boundary for hydraulic computations. If the highest observed WSE or high-water mark is higher than the predicted 50-year WSE at a culvert, bridge, or pipeline, re-evaluate the design water surface elevation to confirm that snow and ice blockage, and other details of the computation are accurate. Given the conditions on the North Slope, it is unlikely that high water marks from a 50-year flood or greater would be recognizable unless it occurred in the last 10 to 20 years. Additionally, it is improbable that a 1- to 5-year field program would experience a 50-year flood. It is more likely that snow and ice blockage greater than accounted for in the model used to predict the 50-year WSE or an error in the downstream boundary condition used in the model has occurred. Use a freeboard at bridges and pipeline crossings which considers the uncertainty in the magnitude of the design flood, the uncertainty in the hydraulic computations, and the height of the ice and debris that may be carried by the flood but is not less than 3 feet. Where an aboveground pipeline crossing is *immediately* upstream from a road, backwater from the road during the pipeline design event should be considered when setting the bottom of pipe elevation. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road wash-out should be considered (i.e., changes in location of the concentrated flow and the impact on erosion at the VSM). Where an aboveground pipeline crossing is *immediately* downstream from a road, the impact of the road on where water would be flowing and the velocity of the water at the pipeline VSM should be considered. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road wash-out should be considered (i.e., changes in the location of the concentrated flow and the impact on erosion at the VSM). Breach ice road crossings sufficiently that ice from crossing would not contribute to ice jams or increase snow and ice blockage during spring breakup.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
	Avoid placing multi-season ice pads in floodplains (e.g., construction pads at the mine site). Prior to HDD construction, provide a monitoring and response plan for determining if drilling mud is being lost to formation or making it to the river or groundwater during drilling. Should any spills occur on the MTI, the affected gravel would be addressed immediately and removed prior to MTI abandonment. If Option 1 or 2 is selected, place and maintain appropriate navigation aids on the MTI after it is decommissioned (the top of the MTI is expected to drop to or below the water surface) Provide annual surveillance of bridge, culvert, and pipeline river crossings to confirm that structures are functioning properly and provide maintenance as required. Continue to collect baseline data regarding discharge, ice and liquid water conditions and distribution, and bank conditions on the Colville River near Ocean Point throughout winters every year until ice bridge construction so that an ice bridge plan can be drafted that would include exact crossing location for bridge and ramps, plans for flow and fish passage management (should they be needed), and actions to be taken at the end of ice bridge use (such as slotting). Prepare an adaptive management plan that provides detail regarding how any unanticipated surface water flow blockages would be identified and corrected as quickly as possible, to avoid lasting environmental impacts. Include erosion mitigation features or options in engineering design of boat ramp(s) to prevent or minimize erosion potential at the boat ramp(s) and along adjacent riverbanks. Develop a maintenance plan for the boat ramps to ensure long-term viability and use of the site(s) while minimizing impacts to the adjacent waterbodies. Include the following points at a minimum: Identify entity responsible for site maintenance Annual maintenance (grading) of parking pads, turning pads, access ramps, and road access Maintain a gravel supply (off-site) to reinforce boat ramps and pads when necessary Regular clean-up of pads and surroundings, including back-haul of trash to suitable disposal site Before construction and continuing through operations, test and monitor freshwater sources that intersect the Project for hydrocarbons.
3.9 – Wetlands and Vegetation	If Alternative C or D is selected, monitor vegetation damage, and compression of soil and vegetation in annual resupply ice road footprint (footprints that are used consecutively each year). Because wetter landscapes show less impact from multiyear ice roads (Yokel, Huebner et al. 2007) and ADNR monitors only tussock tundra and soil compaction, this suggested measure would focus on non-tussock wetlands (including patterned ground) with a Cowardin water regime class of Temporarily Flooded, Saturated, or Seasonally Flooded Ground by vegetation type (total live cover of graminoid, shrub, forb, moss) and percentage of bare soil would be monitored with control points and points within ice road footprints to determine changes. Use vehicle and equipment wash stations and inspect vehicles and equipment for organic matter (e.g., invasive species) prior to moving equipment west of the Colville River to reduce the risk of introducing invasive species. Clean tires and wheel wells so they are free from soils, seeds, and plant parts. Provide stations to clean footwear and gear so they are free from soils, seeds, and plant parts. Provide training to employees and contractors in identification, control, and prevention of known invasive plant species. Confine loading and unloading of soils for gravel stockpiles to the downwind side of the pile; if piles would be on-site for longer periods of time, seed with appropriate vegetation to reduce wind erosion. Wind barriers (such as snow fences) may also be appropriate in some situations.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.10 – Fish	Identify overwintering fish habitat (maximum water depths, particularly free-water depth under ice cover) in the Itkillik River and other tributaries to the Colville River that might intersect the Option 3 ice road. Avoid crossings of potential overwintering habitat. Adopt BMPs suggested by National Marine Fisheries Service for essential fish habitat for invasive species (Limpinsel, Eagleton et al. 2017): 1. Uphold fish and game regulations of the Alaska Board of Fisheries (AS 16.05.251) and Board of Game (AS 16.05.255), which prohibit and regulate the live capture, possession, transport, or release of native or exotic fish or their eggs. 2. Adhere to regulations and use BMPs outlined in the State of Alaska Aquatic Nuisance Species Management Plan (ADF&G 2002). 3. Encourage vessels to exchange ballast water in marine waters (in accordance with the U.S. Coast Guard's voluntary regulations) to minimize the possibility of introducing invasive estuarine species into similar habitats. Ballast water taken on in the open ocean would contain fewer organisms, and these would be less likely to become invasive in estuarine conditions. 4. Discourage vessels that have not exchanged ballast water from discharging their ballast water into estuarine receiving waters.
3.11 – Birds	Locate mast poles away from the pad edge. Minimize light visible from outside of Project facilities *at all times of the year* by using lighting fixtures with lamps contained within the reflector and shading externally facing windows on buildings to minimize the potential for bird strikes. Implement lighting controls to turn off exterior lighting at satellite pads and other unoccupied facilities when personnel are not present, between August 1 and October 31. Minimize the number of tall towers. Limit water withdrawal to lakes without sensitive fish or breeding yellow-billed loons. Route ice roads around identified yellow-billed loon nesting sites and nesting lakes to avoid vegetation compaction at nesting sites and delayed melt-out of nesting lakes. Restrict speed limits to minimize collision hazard and dust production (35 miles per hour except in areas of congestion, on bridges, and on pads, which should be slower). Haze birds out of the blast area before blasting (if resident birds are present in winter). Minimize noise impacts between June 1 and July 15 when birds on nests would be unable to move away from the disturbance. Minimize air traffic during the nesting period when the movements of incubating birds are restricted, and the molting period when birds may be energetically stressed and sensitive to disturbance. Avoid routine use of helicopters during drilling and operations activities to minimize noise and impacts related to birds. Consider revising traffic patterns, altitude, and location to minimize conflicts with molting geese. Avoid preferred habitats, where possible. Minimize barge and support vessel speed to reduce potential for bird strikes. Complete upgrades to the Kuparuk gravel road system involving wetland fill before or after the nesting season (June 1-July 31) if possible.

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.12 – Terrestrial Mammals	BMP E-7 describes requirements related to caribou ramps over pipelines or buried pipelines. The Project could designate specific locations for these, such as northeast of the airstrip in Alternative B, or areas where caribou movements could be funneled or where roads and pipelines would be close together. The decision to add a crossing ramp over a buried pipeline should consider potential negative effects of reduced access to the pipeline for oil spill detection and response and thermokarst or changes in surface flow due to the resulting long-linear ditch that would fill with water. Install game cameras to study the effectiveness of measures used to reduce vehicle traffic impacts, such as stopping traffic or caravanning. Include the following in the vehicle use plan to minimize traffic impacts (plan is required as per ROP M-1): Require vehicles to stop traffic when 25 or more caribou appear to be approaching the road. Require vehicles to caravan or require periodic traffic closures when groups of caribou are near a road and the road has traffic rates of more than 15 vehicles per hour. Caravanning has limited ability to lower calving displacement (Lawhead, Prichard et al. 2004), but it may increase crossing success on roads with high traffic levels (more than 15 vehicles per hour) by providing periods without traffic to allow caribou to cross. It may be easier logistically to close the road for a specified number of hours a day (as determined by BLM) rather than caravanning. Spring, fall, and winter would likely be the periods of greatest concern for caribou crossing Project roads. Restrict Q400 traffic between Alpine and Willow at certain times of year to reduce impacts to caribou. Require the use of propylene glycol for deicing and for vehicle cooling systems, which is not toxic to wildlife.
3.13 – Marine Mammals	None
3.14 – Land Ownership and Use	None
3.15 – Economics	None

Section Number and Resource	Additional Suggested Avoidance, Minimization, or Mitigation
3.16 – Subsistence and Sociocultural Systems	Inform employees who are North Slope residents of company subsistence leave policies and ensure that leave policies are flexible to account for annual variation in the timing and length of subsistence activities. Employ subsistence representatives who receive daily communications on Project activities and report potential conflicts with subsistence users. Subsistence representatives should be provided with clear communication protocols and training, be local and knowledgeable residents, and be included in field activities the community believes have a high potential of conflicting with subsistence uses (e.g., helicopter-based surveys). In coordination with local organizations, such as the Kuukpik Subsistence Oversight Panel (KSOP) (required in CPAI design measure 68 and ROP H-4), ensure communications include the timing and location of development activities such as air traffic, blasting, and other construction activities. Identify areas with high drifted snow accumulation along pipelines after construction and implement a snow management program to clear drifts and create access points (i.e., openings) in areas where drifts accumulate for a long distance (e.g., quarter- and half-mile lengths) along pipelines. Consult with Nuiqsut residents on an appropriate distance for cleared access areas as well as the depth of snowdrifts that impede travel under pipelines. As part of the Subsistence Plan (required in ROP H-1) and as part of the Proponent's notification and consultation with Alaska Native groups (required in ROP H-4), provide equal opportunities for various local entities (e.g., KSOP, NVN, City of Nuiqsut, Kuukpik), in addition to knowledgeable subsistence users, to provide input. Continue to consult with local subsistence users and community organizations regarding the appropriate design and location of subsistence boat ramps, pullouts, and subsistence tundra access ramps. Consult with other operators regarding other boat ramp projects on the North Slope that may inform future designs. (This would be required as part of ROP E-1.) Participate in Conflict Avoidance Agreements with the Alaska Eskimo Whaling Commission to reduce potential impacts on bowhead whale hunting resulting from barge and vessel traffic. Work with community organizations to establish measures to reduce impacts of vehicle traffic on subsistence activities, particularly during the Project's construction phase. Install traffic control signs (e.g., stop signs) to halt industry vehicle traffic at all subsistence access ramps to ensure that subsistence users can cross safely Place development-free buffer around Native Allotment be at least 1 mile to ensure the viability of the allotment for subsistence use. Exceptions would be made for allotment owners who agree to having development closer than 1 mile.
3.17 – Environmental Justice	Continue to use the Kuukpik Subsistence Oversight Panel to maintain meaningful engagement in the Project and identify continuing concerns and specific Project impacts. Attend government to government meetings between the Native Village of Nuiqsut and the BLM, as requested by Native Village of Nuiqsut or BLM, to discuss issues and resolution strategies through construction and operations.
3.18 – Public Health	Limited health data are available for Nuiqsut. The best data available date from the NSB's 2010 survey. Funding a collection of health information for Nuiqsut and studies of contaminant levels in local subsistence resources would provide better data for evaluation of potential health effects associated with oil field development and operation. Create a public health monitoring program at a regional level to track health indicators that are vulnerable to impacts from oil and gas activities. These indicators should focus on health outcomes and/or determinants of local concern that can be tied to oil and gas activity. Where possible, indicators should include threshold levels and specific actions should be developed for when thresholds are surpassed. The State should be responsible for the development and implementation of the monitoring program; however, the NSB and the Alaska Native Tribal Health Consortium should be consulted in the identification of appropriate indicators, thresholds, and responsive actions. Establish a Nuiqsut public health coordination group to conduct health education and engage the community in the public health monitoring program described above.
3.19 – Cumulative Effects	None
4.0 Spills	None

Note: ADNR (Alaska Department of Natural Resources); BLM (Bureau of Land Management); BMP (best management practice); GMT-2 (Greater Mooses Tooth 2); HDD (horizontal directional drilling); MTI (module transfer island); NPR-A (National Petroleum Reserve in Alaska); PM (particulate matter); ROPs (required operating procedures); USACE (U.S. Army Corps of Engineers); VSM (vertical support member); WSE (water surface elevation).

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Willow Master Development Plan

Appendix I.2

ConocoPhillips Road Optimization Memorandum

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Willow Master Development Plan

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Dust Control Plan

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Willow Master Development Plan

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ConocoPhillips Road Optimization Memorandum

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ConocoPhillips Road Route Screening Process

June 5, 2019

Introduction

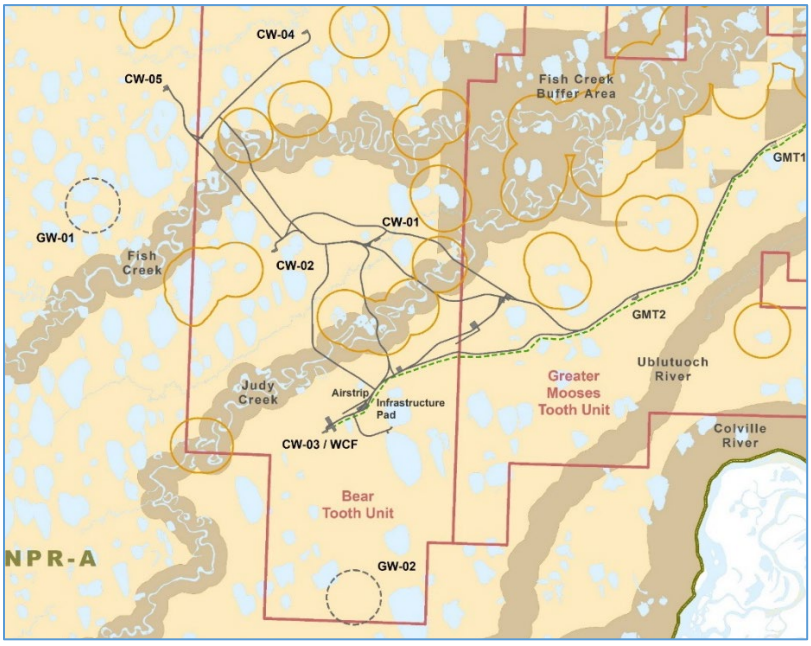
On March 3, 2019, ConocoPhillips Alaska, Inc. (CPAI) hosted a meeting with the Bureau of Land Management (BLM), the U.S. Environmental Protection Agency (EPA), and the U.S. Army Corps of Engineers (USACE). The purpose of the meeting was to review the evolution of road route concepts assessed by CPAI for the Willow development. From 2017 through the first half of 2019, CPAI undertook a significant program of field research and data gathering to inform infrastructure placement and road routing options for the Willow development. CPAI initially considered over 20 road route options, which were screened by CPAI down to three development concepts for analysis in the Environmental Evaluation Document (EED). This memo summarizes the process used by CPAI to generate road route concepts, and to perform screening evaluations of those concepts. This memo also documents information that was discussed during the March 3rd meeting with EPA and the USACE.

Initial Route Creation and Screening

Beginning in 2017, information was compiled and analyzed by a multidisciplinary team of civil engineers, petroleum engineers, environmental scientists, biologists, North Slope operations personnel, geoscientists, and construction planners in order to identify and minimize potential environmental impacts in addition to optimization of the overall road routing.

CPAI personnel and consulting experts identified initial road segments using a combination of satellite imagery and aerial photography, environmental studies (caribou, fish, avian, wetlands, hydrology, and cultural resource surveys), exploration and environmental field expertise, and an awareness of subsistence hunters' perspectives. Twenty-two road segments were developed, which were then organized into eight potential road alignments. Figure 1, below, shows the initial route alignments.

Figure 1. 2017 Initial Willow Road Segments



CPAI screened the road route options considering the following:

- Best Management Practices (BMPs) and Stipulations from BLM's 2013 Integrated Activity Plan for the NPR-A
- Guidelines in the BLM NEPA Handbook

- Section 404 of Clean Water Act and Section 10 of the Rivers and Harbors Act considerations, including a Least Environmentally Damaging Practicable Alternative (LEDPA). Practicability included costs, safety, and logistics.
- National Environmental Policy Act (NEPA) guidelines on alternatives selection
- Key comments from stakeholders on recent developments in the region
- Light Detection and Ranging (LIDAR) survey data, and a preference to avoid higher value wetlands
- Integrated Terrain Unit (ITU) habitat and wetlands mapping
- Avian Studies including yellow-billed loon nest observations
- Fish surveys and lake bathymetry data
- Hydrology studies
- Cultural resource surveys
- Subsistence surveys, including an awareness of locally important resources, methods, and use areas
- Caribou surveys
- Engineering recommendations for suitable bridge crossing locations and bridge span length
- Total road mileage and acreage of gravel fill in wetlands
- Support for future development by potentially reducing impacts from future projects on other CPAI leases
- Spill avoidance, inspection, and response
- Health and safety considerations

During the summer and fall of 2017, CPAI conducted studies to inform initial road routing options from infrastructure in the Greater Mooses Tooth Unit (GMTU) to the early Willow drillsite locations (CW-01 through CW-05).

Note that the early Willow drillsite locations are not the same locations as those now being considered for the Willow Master Development Plan (MDP) Environmental Impact Statement (EIS). Rather, the early locations were determined based on subsurface information known at the time. Drillsite locations have since been refined based on additional information as described below.

The initial eight road alignments were split into three categories:

- Northern routes: The most direct access from GMT2 to the early Willow CW-01 and CW-02 drillsite locations.
- Mid-routes: The most direct access to the full suite of Willow infrastructure including the proposed processing facility location, minimizing road lengths and providing the shortest bridge lengths at stream crossing locations.
- Southern Routes: These routes best complied with stipulations and/or BMPs in the 2013 Integrated Activity Plan (IAP; BLM 2013) and minimized the number of waivers required.

Criteria used to evaluate the eight routes included:

- Total road mileage, used to compare relative wetlands impacts and cost
- Judy Creek bridge crossing location and length, including potential impacts to streams from pier groups.
- Road length within the 3-mile wide Fish Creek setback established by IAP BMP K-1
- Conformance with other BLM stipulations including:
    - Avoidance of yellow-billed loon nest/nesting lake setbacks (IAP BMP E-11)

- Avoidance of 500-foot setback around waterbodies (IAP BMP E-2)
- Avoidance of ¼-mile setback around deepwater lakes (IAP BMP K-2)

- Route uniqueness compared with other routes.

Potential impacts to cultural resources were also considered, however, no impacts to cultural resources were identified for any of the evaluated routes thus it was not a differentiating factor in route selection.

Of the eight routes evaluated, four were screened out by CPAI and the remaining routes were analyzed in in more detail. Table 1 summarizes the eight routes evaluated and additional details are provided in the EED.

Table 1. Initial Road Route Alternatives Evaluated

Route	Road Miles[1]	Judy Creek Bridge (ft.)	Crosses Fish Creek Setback[2]	Crosses YBLO Buffer	Advanced for CPAI Analysis	Notes
North 1	37.6 mi	450	Y	Y	Y	Provides the most direct access from GMT2 to CW-01 and an optimal crossing location of Judy Creek with one of the shortest bridges. Includes essential crossing of the Fish Creek Setback (BMP K-1).
North 2	38.9 mi	-	Y	N	N	Similar to but longer mileage than North 1 and North 3. Places 2 miles of road in Fish Creek Setback (BMP K-1). Route not sufficiently distinct from other routes evaluated (North Route 1) but would require additional deviation from BMP K-1. Other similar routes (North Route 1, North Route 3) further minimize or avoid infrastructure in Fish Creek setback.
North 3	36.9 mi	1,400	N	Y	Y	Provides direct access from GMT2, but it would have a longer bridge crossing of Judy Creek than North 1.
Mid 1	35.5 mi	420	N	Y	Y	Provides shortest overall road length and minimizes tundra footprint.
Mid 2	42.3 mi	420	N	Y	N	Not sufficiently distinct from other routes evaluated (Mid Route 1) and would require additional deviation from BMP E-11. Other similar routes would have a smaller total footprint.
South 1	37.0 mi	1,850	N	N	Y	Conforms to BMPs and stipulations to the maximum extent practicable but has the longest bridge crossings of Judy Creek.
South 2	42.3 mi	1,850	N	N	N	Not sufficiently distinct from other routes evaluated (South Route 1). Other similar routes would have a smaller total footprint.
Southwest	37.3 mi	-	N	N	N	Not sufficiently distinct from other routes evaluated (South Route 1) and would require additional deviation from BMP K-2. Other similar routes further minimize infrastructure near deepwater lakes.

[1] Road mileages evaluated with common crossing of Fish Creek to access northern drillsites
[2] Established by BMP K-1; excluding essential crossings
Y: Yes; N; No; -: not evaluated; ft.: feet; BMP: best management practice

In addition to the eight routes discussed above, two Fish Creek crossing locations were also considered to connect drillsites CW-04 and 05 to the CW-02 area: west and central routes (see Figure 1). Table 2 describes the routes considered.

Table 2. Fish Creek Crossing Alternatives Evaluated

Route	Road Miles	Fish Creek Bridge (ft.)	Crosses Fish Creek Setback[1]	Crosses YBLO Buffer	Advanced for further CPAI Analysis	Notes
West	12.9	850	N	N	Y	Avoids known yellow-billed loon setbacks (BMP E-11) and provides the shortest alignment to early drillsite locations.
Central	13.4	650	N	Y	N	Provides shortest Fish Creek bridge but requires more road length, gravel fill, and crosses through yellow-billed loon setback (BMP E-11) near Fish Creek.

[1] Established by BMP K-1; excluding essential crossings
Y: Yes; N; No; -: not evaluated; ft.: feet; BMP: best management practice

Figures 2 through Figure 5 show the four road routes that were advanced during the 2017 screening process.

Figure 2. North Route 1 Road Alignment

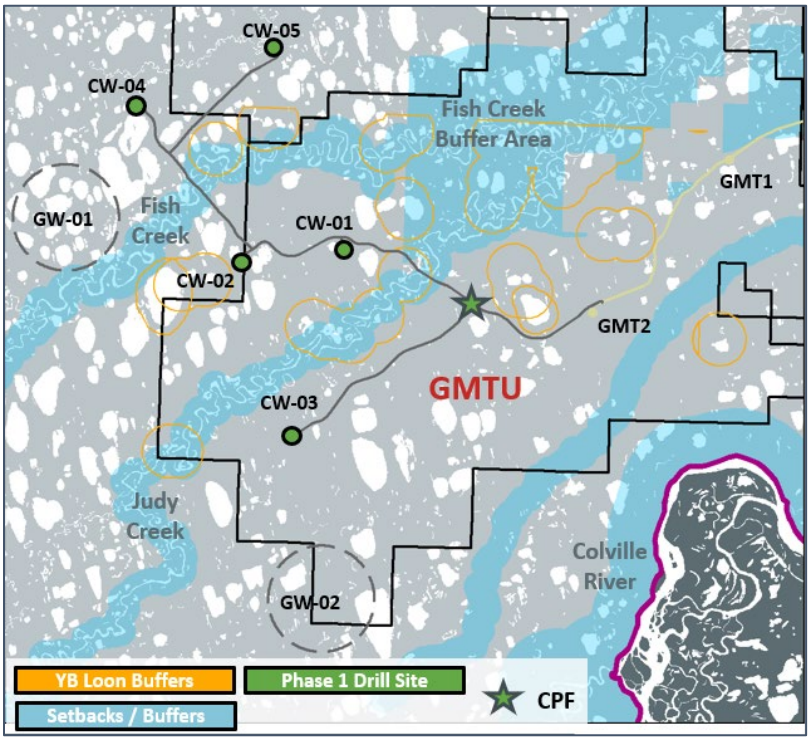


Figure 3. North Route 3 Road Alignment

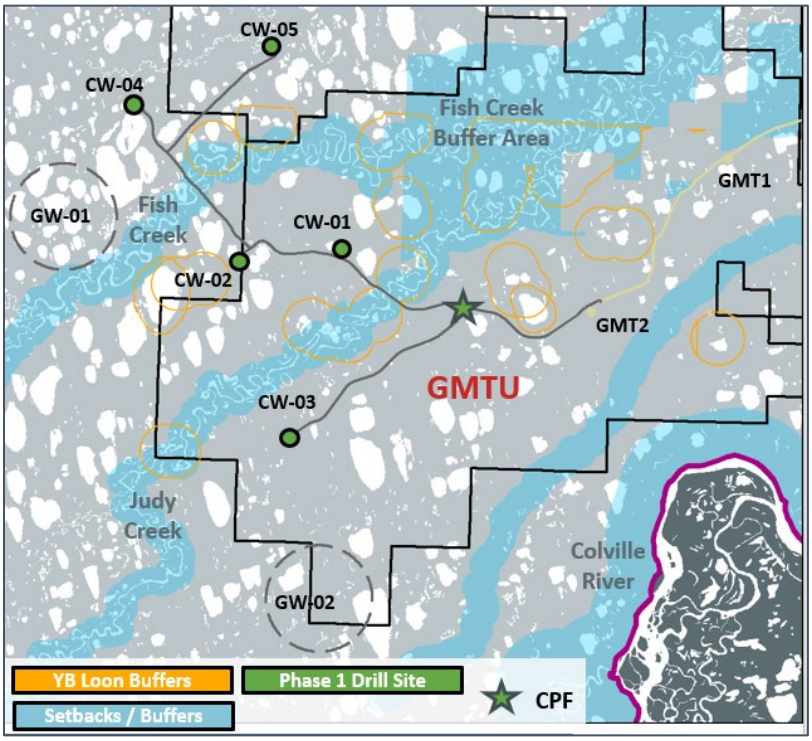


Figure 4. Mid Route 1 Road Alignment

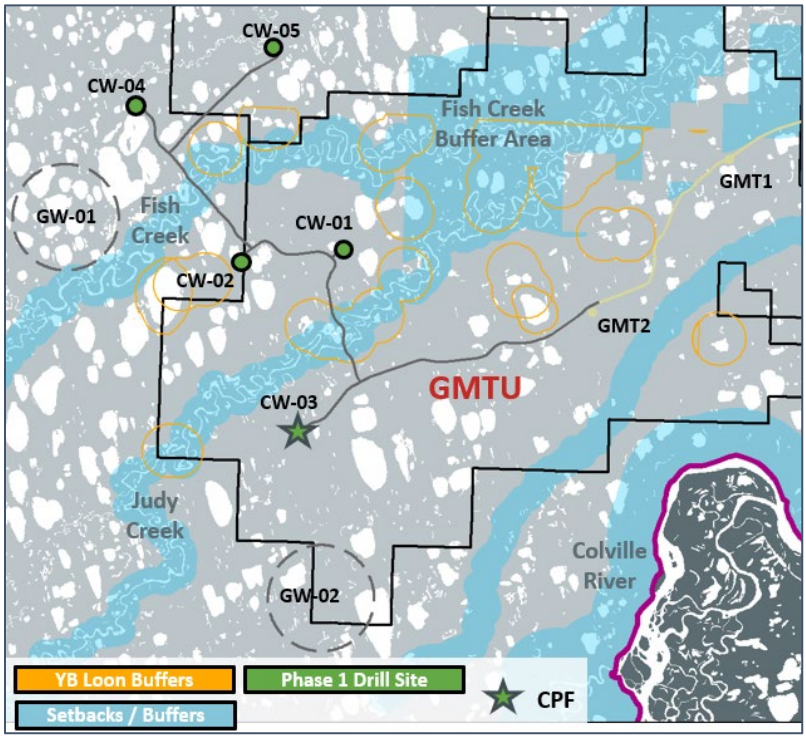
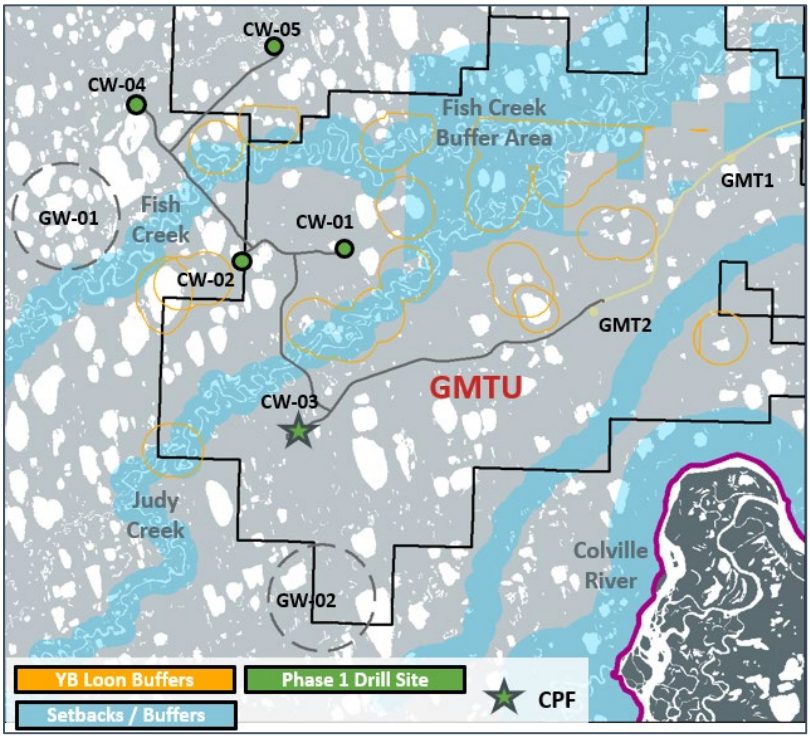


Figure 5. South Route 1 Road Alignment



Drillsite Location Refinement and EED Route Identification

After analyzing subsurface data from the 2018 Willow appraisal drilling season, CPAI refined some drillsite locations to further optimize recovery of the subsurface resource, while minimizing surface disturbance. The updated drillsites were located within the overall geographic area as the original sites, and the road routing evaluation criteria that was used during the previous screening effort was utilized to assess road route options to the new drillsite locations. Project engineers reevaluated the same general alignment corridors, bridge crossing locations, and road segments identified in 2017. During the spring and summer of 2018, LIDAR surveys were conducted throughout the field in order to further refine road routings, stream crossings, and bridge locations. New data from ongoing environmental studies including hydrology, avian surveys, fish surveys, ITU and wetlands mapping, and caribou surveys were also incorporated into route development and evaluation. CPAI shared the initial road alignments with the BLM and other regulatory agencies and received feedback that was also incorporated into road alignment reevaluation.

Route development and evaluation criteria and considerations were similar to those identified during initial route creation and screening but incorporated additional and/or more refined data. Criteria used for route development and evaluation included:

1. Gravel Footprint: Early analysis utilized road mileage as a surrogate for gravel footprint, as it assumed constant road width and depth based on aerial photography. Subsequent analysis used the LIDAR survey data and routings were optimized to avoid significant topographic changes that would increase gravel depth and footprint.
2. Caribou Migration Effects: Care was taken to minimize the potential for corralling effects due to loops or forks in the road.
3. Avoidance of Special Areas: Priority was given to avoidance of the Fish Creek 3-mile buffer (BMP K-1) as well as minimizing roadway length in the Judy Creek and Fish Creek ½-mile buffers upstream of the Fish Creek/Judy Creek confluence (BMP K-1). Additional special area considerations given to the Colville River Special Area and the Teshekpuk Lake Caribou Habitat Special Area (BMP K-5)

4. Stream Crossings: Routes were selected and evaluated with consideration given to the minimization of stream crossing impacts, mainly evaluated by the number of pile groups or pier groups in waterbodies.
5. Yellow-billed Loon Setback: Routes minimized crossing yellow-billed loon setbacks (defined as the area 1-mile from identified nests and 500 meters from the nesting lakes as stipulated in BMP E-11). Some routes may cross buffers where tradeoffs exist between crossing a setback and other potential environmental impacts, such as increased gravel fill. Discussion with BLM personnel in 2018 indicated that a waiver process allows for encroachment into setback, if it avoids causing more substantial impacts elsewhere, and that reducing gravel fill should be prioritized over encroaching within the setback.
6. Waterbodies Setback: Routes maintained waterbodies setback of 500 feet as stipulated in the 2013 IAP (BMP E-2)
7. Deep Water Lakes Setback: Routes maintained deep water lakes setback of ¼ mile as stipulated in the 2013 IAP (BMP K-11)
8. Teshekpuk Lake Caribou Habitat Area: Minimization of footprint in the Teshekpuk Lake Caribou Habitat Area (IAP BMP K-5)
9. General use of higher, drier ground: This is both a good engineering and maintenance practice, as well as use of a general assumption that drier ground was correlated with less highly functioning wetland areas.

Based on this evaluation, two road alignments, generally based on the Mid Route 1 and South Route 1 initial road alignments, were selected for further analysis as part of three alternatives within CPAI's Willow MDP EED.

EED Alternative 1

EED Alternative 1 was based generally on the road alignments evaluated as part of the Mid Route 1 alignment. The overarching goal in developing this road alignment was to minimize wetland impacts by selecting the most direct route from GMTU to proposed Willow facilities. This included the minimization of road length as well as the minimization of road footprint through optimization of topography by locating the road on generally higher, drier ground. It would also minimize wetland impacts by selecting optimal stream crossings to minimize bridge crossing lengths and gravel footprint within floodplains and adjacent wetlands. Alternative 1 would provide the shortest road alignment between drillsites and minimize the length of the Judy Creek bridge (420 feet) but it has the tradeoff of passing through yellow-billed loon nest/nesting lake setbacks near Judy Creek and would have a longer bridge at the Fish Creek crossing (1,100 feet). (Note: please refer to the EED for maps of the EED Alternatives.)

EED Alternative 2

Based on guidance from the BLM, this alternative sought to minimize the number of waivers to the 2013 IAP BMPs but requires tradeoffs of a greater gravel footprint and sub-optimal stream crossings. A major factor in this routing is avoidance of the yellow-billed nest buffers (BMP E-11), which drives additional road length, a longer bridge crossing of Judy Creek stream, the longest road mileage of the routes considered, and substantially more infrastructure in the Teshekpuk Lake Habitat Area (BMP K-5).

EED Alternative 3

This alternative evaluated a development scenario where the Willow area is not connected by gravel road to GMTU. This alternative reduces overall gravel footprint but results in tradeoffs of additional air traffic, freshwater use, subsistence impacts and reduced stakeholder access benefits, and challenges in emergency response (including spill) access. The gravel road alignments from the Willow processing facilities to each drillsite follow the same alignments considered as part of EED Alternative 1.

EED Alternative Evaluation

Table 2 summarizes CPAI's analysis of the road alignments evaluated in the Willow EED (September 2018) based on the evaluation criteria. Based on the overall minimization of gravel fill (and thus minimization of fill in wetlands and other water of the U.S.), minimization of the length of the Judy Creek bridge crossing, and balancing other environmental tradeoffs including compliance with the 2013 IAP BMPs, CPAI selected Alternative 1 as its proposed project for Willow development.

Table 2. Alternative Road Routes Evaluated

Project Component		Alternative 1	Alternative 2	Alternative 3
Gravel Roads		37 miles; 273 acres Eight 0.3-acre turnouts with ramps (2 acres total)	45 miles; 326 acres Nine 0.3-acre turnouts with ramps (3 acres total)	28 miles; 200 acres Six 0.3-acre turnouts with ramps (2 acres total)
Bridges (number)		8	10	7
Bridges (length)	Judy Creek	420 feet	1,850 feet	420 feet
	Judy Creek Kayyaaq	75 feet	Crossing 1: 75 feet; Crossing 2: 75 feet	75 feet
	Fish Creek	1,100 feet	850 feet	1,100 feet
	Kalikpik River	500 feet	550 feet	500 feet
	Willow Creek 2	80 feet	80 feet	NA
	Willow Creek 4	130 feet	130 feet	130 feet
	Willow Creek 4a	90 feet[1]	90 feet[1]	90 feet[1]
	Willow Creek 5	NA	20 feet[1]	NA
	Willow Creek 7	NA	75 feet[1]	NA
	Willow Creek 8	30 feet[1]	NA	30 feet[1]
	Other	Stream and cross drainage culverts as required	Stream and cross drainage culverts as required	Stream and cross drainage culverts as required
Acres in Special Areas	Acres in Colville River Special Area	8 acres	8 acres	NA
	Acres in Teshekpuk Lake Special Area	110 acres	130 acres	103 acres
Compliance with BLM BMPs	Acres in Teshekpuk Lake Caribou Habitat Area (BMP K-5)	19 acres, no deviation anticipated	56 acres, no deviation anticipated	19 acres, no deviation anticipated
	Yellow-billed Loon Nest/Lake Setback Deviations (BMP E-11)[2]	Lake M0151 (nesting lake shoreline setback) Lake M1522 (nesting lake shoreline setback, nest setback) Lake M1523A (nesting lake shoreline setback, nest setback) Lake M1524 (nest setback) Lake M0303 (nest setback)	Lake M0151 (nesting lake shoreline setback)	Lake M1522 (nesting lake shoreline setback, nest setback) Lake M1523A (nesting lake shoreline setback, nest setback) Lake M1524 (nest setback) Lake M0303 (nest setback)
	River Setback Deviations (BMP K-1)	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek	Essential road/pipeline crossing of Judy Creek Essential road/pipeline crossing of Fish Creek
	Deepwater Lake Setback Deviations (BMP K-2)	Lake M0015	Lake M0015	Lake M0015

[1] Bridge versus culvert battery crossing structure to be determined.
[2] 1-mile nest setback and 1,625-foot (500-meter) nesting lake shoreline setback.
Notes: All values are approximate and subject to change; BMP: best management practice.

EIS Alternative Development

A description of the EED Alternatives was submitted to BLM and co-operating agencies in May 2018 and updated in September 2018. CPAI understands that these alternatives were considered by the agencies as part of the EIS alternative development process.

Since submittal of the EED, CPAI has also supported EIS alternative development through technical and engineering support. This has included further refinement and changes to the proposed project based on agency feedback. For example, in October 2018, at the request of BLM and co-operating agencies, CPAI evaluated moving the BT4 drillsite out of the Teshekpuk Lake Caribou Habitat Special Area (K-5) and east of the Kalikpik River. While infrastructure and development are allowed within the K-5 area, the agencies suggested locating the drill site outside of this area if practical. CPAI evaluated this request and was able to accommodate it with an associated negative impact to subsurface resource recovery. The shift of the BT4 drillsite caused another evaluation of the road route between BT2 and BT4 including the elimination of a bridge over the Kalikpik River.

CPAI also continued to advance engineering for the proposed project this spring to further avoid and minimize impacts. The most recent revision to the proposed project (March 2019) optimized the road alignments by incorporating the latest topographic data, gathered in the summer of 2018. Changes to the road alignments were made to avoid wetlands that are permanently inundated (H class water regime) or located within 500 feet of fish bearing waters. These changes were made in locations where design constraints would not be compromised. Updates have also been made to estimates of bridge lengths with specific focus on the Fish Creek crossing, reducing the bridge length from the June 2018 concept of 1,100 feet down to the current concept of approximately 500 feet.

Conclusions

From eight original route routes considered, CPAI screened out five using the criteria described above, and then advanced three for inclusion in the EED. CPAI understands that BLM is including CPAI's proposed project and two alternatives in the draft EIS that is in preparation, and that the three EIS alternatives share similar road alignments. While CPAI anticipates further refinements to road alignment may occur as engineering and the NEPA and permitting processes progress, the substantial analysis already completed demonstrate that the road alignments carried forward in the EIS meet the requirements of the 404(b)(1) Guidelines which requires a LEDPA project. As the routes evaluated by CPAI demonstrate, other road alignments, which are not included in the EIS, are unlikely to meet LEDPA requirements because they would result in greater fill to wetlands and would have a greater impact to the environment compared to the alternatives which are included in the EIS.

Willow Master Development Plan

Appendix I.3
Dust Control Plan

August 2020

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Willow Dust Control Plan

Scope

This Standard Operating Procedure (SOP) applies to ConocoPhillips Alaska, Inc. (CPA) and contractor personnel at Willow.

Regulatory Requirement

Fugitive dust consists of particulate matter (PM). The U.S. Environmental Protection Agency and the Alaska Department of Environmental Conservation (ADEC) define fugitive dust as "particulate matter that is generated or emitted from open air operations (emissions that do not pass through a stack or a vent)." The most common forms of PM are known as PM10 (particulate matter with a diameter of 10 microns or less) and PM2.5 (particulate matter with a diameter of 2.5 microns or less).

Alaska's current regulations that address fugitive dust include:

- 18 AAC 50.045(d)[1]: A person who causes or permits bulk materials to be handled, transported, or stored, or who engages in an industrial activity or construction project, shall take reasonable precautions to prevent particulate matter from being emitted into the ambient air.
- 18 AAC 50.110[1]: No person may permit any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property.

Currently, ADEC applies its regulatory authority under 18 AAC 50.045(d)[1] to request fugitive dust sources apply “reasonable precautions” to reduce emissions.

Fugitive Dust Sources

Fugitive dust could be generated directly from road and pad construction, facility construction, and during operations and maintenance. The following construction activities are typical examples of activities that have the potential for generating fugitive dust:

- Movement of vehicles and motorized equipment
- Bulldozing and grading
- Excavation and filling
- Blasting
- Material movement, including loading and unloading
- Hauling of loose materials
- Use of parking, staging, and storage areas

[1] 18 AAC 50 as amended though January 8, 2020.

It is the responsibility of the Project entity's Construction Contractor(s) and the Project entity's Field Environmental Coordinators to ensure all sources of dust generation are identified.

Purpose

The purpose of this Standard Operating Procedure is to ensure compliance with ADEC air quality regulations, summarized above, and applicable project permitting stipulations, such as from the Bureau of Land Management, the U. S. Army Corps of Engineers, or the North Slope Borough. (Future update after permits are issued: permit numbers to be added as references, from any permits containing relevant fugitive dust stipulations).

Engineering & Administrative Controls

The Willow road and pad construction is typical of North Slope design and installation, consisting of a minimum of 5 foot of gravel fill above tundra level with 2:1 side slopes. The roads are designed with dust control in mind, and the specifications call for well graded sandy-gravel with low fines content in order to minimize both dust (during dry and/or hot conditions) as well as mud during the shoulder seasons and especially wet summer weather.

Willow utilizes both the Western North Slope (WNS) standard 32 foot wide (shoulder to shoulder) roads within the core field area, as well as 24 foot wide (shoulder to shoulder) roads at the outlying drill sites. Speed limits on the 32 foot wide roads are generally 35 mph. Due to safety concerns, speeds are reduced to 25 mph on the 24 foot wide roads. Speed limits are enforced by Security personnel. The table below displays road width and speed limits by segment.

Road Segment	Width (feet, driving surface)	Speed Limit (mph)
GMT2 to WOC	32	35
WOC to WCF	32	35
WOC to BT1	32	35
BT1 to BT2	32	35
BT2 to BT4	24	25
WCF to BT3	24	25
BT3 to BT5	24	25

Procedures

Large-scale dust control will be accomplished using on-site water trucks or other suitable equipment. Planned dust control equipment at Willow currently consists of two 325 bbl capacity water trucks, operating 24 hours per day under normal operations. However, if the need arises, vacuum trucks operating in other services can be utilized temporarily as dust control trucks. Dust

control activities will be monitored and scheduled by Western North Slope (WNS) Roads and Pads personnel. Activities will be conducted in a manner to comply with applicable permit stipulations. The following procedures will be utilized during dust control activities:

1. Conduct annual training for dust control regarding permit stipulations application, procedures, and techniques, identification of dust control areas, and location of permitted water sources.

    a. All Roads & Pads operators will be provided annual training that includes:

        i. Importance of proper dust control (air permit fugitive emissions stipulations, USACE permit stipulations, vegetation impacts, etc.)

        ii. Permit stipulations pertaining to water sources (fish screens, volume tracking, ADEC dewatering log, etc.)

        iii. Identification of areas needing dust control (road and pad surface conditions, lighter colored areas developing, discoloration of snow, visible dust in road, etc.)

        iv. Priority areas for dust control (active drilling locations and airstrips)

        v. Location of permitted water sources (impoundments, lakes and secondary containments)

        vi. Proper watering techniques (prevent erosion, ensure dust is controlled, etc.)

2. Reduce dust control activities when precipitation (rain, snow, frost, dew, fog, etc.) provides adequate coverage.

3. Apply proper amount of water at appropriate rates of application to avoid the creation of localized erosion due to water runoff.

4. Collect water for dust control from permitted raw water sources (e.g., lakes, impoundments).

5. Routinely inspect and evaluate facilities regarding dust control.

6. The following list recommends a watering frequency based on the number of expected vehicle trips;

    - Main Roads (32 foot width) – Once per day or as needed.

    - Secondary Roads (24 foot width) – Every 3 days or as needed. Watering frequency will increase to daily while there is an active drilling rig on the associated pad.

- WOC and WCF – Once per day or as needed.
- Drill Sites with rig activity – Every day or as needed.
- Drill Sites without rig activity – Every three days or as needed.
- Willow Airstrip – Twice daily or as needed.

7. Changes to watering frequency will be based on observations from Roads and Pads personnel, including gravel surface conditions, visible dust, or recent deposits on nearby snow or vegetation. Additional watering determinations are made at the discretion of the Roads and Pads Foreman and/or Operations personnel.

Inspection, Monitoring and Recordkeeping

Roads and Pads personnel will perform regular inspection and evaluation of facilities regarding dust control, and inspections will include surrounding areas to determine if visible dust accumulation are present on adjacent vegetation.

- Dust control activities and their effectiveness will be documented by recording to following information in a log book by the watering truck operator. Logs will include the following:
  - Date, time, and location (road segment)
  - Wind conditions (windy, calm)
  - Road surface conditions (dry, damp, wet).
  - Purpose: Watering for scheduled maintenance or based on road/pad conditions.

The watering logs will be available for review by interested local agency representatives upon request. Logs will be retained for a minimum of five years. Additional records of any deviations from the dust plan, along with the reasons for the deviation and corrective actions taken, will also be retained for at least five years.

Willow Master Development Plan

Appendix J

National Petroleum Reserve in Alaska Integrated Activity Plan Environmental Impact Statement Traditional Knowledge Compilation

August 2020

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Willow Master Development Plan

Appendix J

National Petroleum Reserve in Alaska Integrated Activity Plan Environmental Impact Statement Traditional Knowledge Compilation

August 2020

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National Petroleum Reserve in Alaska Integrated Activity Plan
Environmental Impact Statement
Traditional Knowledge Compilation

September 19, 2019

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Table 3-1: Traditional Knowledge Topics by Source 3

LIST OF ACRONYMS

ADF&G	Alaska Department of Fish and Game
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
EIS	Environmental Impact Statement
IAP	Integrated Activity Plan
MMS	Mineral Management Service
NPR-A	National Petroleum Reserve – Alaska
SRB&A	Stephen R. Braund & Associates
USACE	United States Army Corp of Engineers

1.0 Traditional Knowledge Compilation

This report provides a compilation of available traditional knowledge that has been documented in the six North Slope communities of Point Lay, Wainwright, Utqiaġvik (formerly Barrow), Nuiqsut, Atqasuk, and Anaktuvuk Pass since 1976 and which is relevant to the National Petroleum Reserve – Alaska (NPR-A). Traditional knowledge is defined in a broad sense to include local observations and information that residents have provided regarding their physical, biological, and social environment. In response to a request from the Bureau of Land Management (BLM) that traditional knowledge be considered in the writing of the NPR-A Integrated Activity Plan (IAP) Environmental Impact Statement (EIS), EMPSi subcontracted Stephen R. Braund & Associates (SRB&A) to review existing sources of traditional knowledge and compile the information into a report. The purpose of this compilation is to provide relevant traditional knowledge organized by various resource topics for consideration and incorporation in the EIS by the EIS resource authors.

SRB&A organized the traditional knowledge quotes using the section headings that are similar to those used in the NPR-A IAP EIS structure. When reviewing the quotes, EIS authors should review the entire document as the quotes often address multiple topics and not just the topic under which SRB&A categorized them (e.g., vegetation and caribou traditional knowledge addressed in the same quote but only categorized under vegetation).

2.0 Methods

The study team reviewed a variety of sources including the Alaska Department of Fish and Game (ADF&G), Division of Subsistence technical papers; Bureau of Ocean Energy Management (BOEM)/Bureau of Safety and Environmental Enforcement (BSEE), Bureau of Land Management (BLM), Mineral Management Service (MMS) and United States Army Corp of Engineers (USACE) public hearings conducted for EISs; and federal, Native organization, and academically funded studies. The study team's initial review also included a number of studies such as subsistence studies, ethnographies, and EISs which are informed by or incorporate traditional knowledge. For the purposes of this review, the study team only documented sources that contained primary traditional knowledge (e.g., direct quotes included as part of a traditional knowledge or subsistence study, academic publication, or federal public hearings). The study team also only included quotes directly attributed to residents from the six North Slope communities, which are most likely to have direct observations related to the NPR-A.

Each quote identifies the community that provided the observation and the citation for the document. Both the community identifier and publication year attached to the quote provide important context and should be kept in mind when reviewing the quotes for applicability to the NPR-A IAP EIS. For example, some quotes dating from the early 1980s may describe effects associated with seismic survey methods that are no longer being used and may not be applicable to more current seismic survey methods.

The study team focused on compiling quotes that contained traditional knowledge applicable to the nature of development and relevant to impacts and mitigation associated with the IAP, or that contained traditional knowledge about the environment in and around the NPR-A. For example, with caribou, the study team focused on quotes describing knowledge about past impacts to caribou that could parallel potential impacts from future projects described in the IAP or quotes that focused on caribou habitat and movement in the NPR-A. The study team did not include more general traditional knowledge describing overall caribou distribution, migration, behavior, health, or abundance.

For several resource topics, SRB&A identified little to no traditional knowledge relevant to the NPR-A IAP/EIS in the 80 sources reviewed for this compilation. Topics lacking traditional knowledge included Geology and Minerals, Soil Resources, Sand and Gravel Resources, Environmental Justice, Recreation, Wild and Scenic Rivers, Wilderness Characteristics, and Transportation. Other such as Petroleum Resources, Paleontological Resources, and Visual Resources had only a few traditional knowledge quotes identified. The lack of traditional knowledge identified for the above topics does not mean that local residents are not knowledgeable about those topics, but rather that the sources reviewed did not focus on those topics. Furthermore, during the compilation, the study team categorized traditional knowledge quotes under the resources they were most directly related to; thus, some of the above topics may be addressed indirectly under other resources, in which case SRB&A identified the primary topic where related traditional knowledge could be found in the report. Additional reasons for the lack of traditional knowledge for certain topics that are relevant to the NPR-A IAP EIS include the following:

- A majority of the sources available for review were public scoping testimony, and residents' testimony usually focuses on the issues of greatest concern, and thus do not include traditional knowledge for all physical, biological, and social topics addressed in an EIS.
- Resource topics overlap in their focus, and traditional knowledge that is categorized as one topic may also pertain to another (e.g., socioeconomic/environmental justice, hazardous materials and contaminated sites/human health and safety/air quality).

While SRB&A's review included all major topics addressed in the NPR-A IAP EIS, SRB&A emphasized topics of concern that have been raised by local residents in the past including air quality, water resources, caribou, fish and fish habitat, noise, subsistence, sociocultural systems, economy, and public health. SRB&A also emphasized traditional knowledge that addressed key topics/questions provided to SRB&A by the EIS resource section authors. Where applicable, SRB&A added these topics as subheadings (e.g., Caribou under Terrestrial Mammals, Water Quality under Water Resources). SRB&A also added additional subheadings under several of the resource topics when there were many quotes that could be categorized under several themes. SRB&A's review also did not include a review of residents' issues and concerns regarding development in general or any mitigation measures proposed by residents in past projects.

3.0 Results

3.1 INTRODUCTION

SRB&A reviewed 80 sources of traditional knowledge from publications dating between 1976 and 2019 (Table 3-1). The table lists each of the sources reviewed and provides relevant traditional knowledge topics addressed in each source under Physical, Biological, and Social environment headings. The table also includes a heading of Other that primarily identifies if the source included scoping comments and issues and concerns. The following sections provide traditional knowledge quotes by the NPR-A IAP EIS sections.

Table 3-1: Traditional Knowledge Topics by Source

Citation	Physical Environment	Biological Environment	Social Environment	Other
(ABR Inc., Sigma Plus Statistical Consulting Services, Stephen R. Braund & Associates, and Kuukpik Subsistence Oversight Panel Inc. 2007)	Climate and Meteorology, Water Resources, Solid and Hazardous Waste	Fish	Subsistence Uses and Resources	—
(BLM 1982)	Water Resources	—	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 1997a)	Acoustic Environment	—	Terrestrial Mammals	Scoping Meeting / Issues and Concerns
(BLM 1997b)	Paleontological Resources, Solid and Hazardous Waste	—	Cultural Resources, Subsistence Uses and Resources, Public Health	Scoping Meeting / Issues and Concerns
(BLM 1998a)	—	Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 1998b)	—	Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(BLM 1998c)	—	Birds, Terrestrial Mammals, Marine Mammals	Landownership and Uses, Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 1998d)	—	Subsistence Uses and Resources	Public Health	Scoping Meeting / Issues and Concerns
(BLM 2002)	—	Terrestrial Mammals	Landownership and Uses, Subsistence Uses and Resources, Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BLM 2003a)	Acoustic Environment	Fish, Birds, Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2003b)	Water Resources	Wetlands and Floodplains, Terrestrial Mammals, Marine Mammals	Subsistence Uses and Resources, Sociocultural Systems, Public Health	Scoping Meeting / Issues and Concerns
(BLM 2003c)	—	Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2003d)	Water Resources	Terrestrial Mammals	Subsistence Uses and Resources	
(BLM 2004a)	Vegetation	—	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2004b)	Renewable Energy	Fish	—	Scoping Meeting / Issues and Concerns
(BLM 2004c)	Water Resources	Birds, Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2004d)	Vegetation	Terrestrial Mammals	Subsistence Uses and Resources, Economy	Scoping Meeting / Issues and Concerns
(BLM 2004e)	—	—	Economy	Scoping Meeting / Issues and Concerns
(BLM 2004f)	Climate and Meteorology	Vegetation, Fish, Terrestrial Mammals	Landownership and Uses, Subsistence Uses and Resources, Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BLM 2007)	—	Wildland Fire, Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns

Citation	Physical Environment	Biological Environment	Social Environment	Other
(BLM 2014a)	—	—	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2014b)	—	—	Subsistence Uses and Resources, Economy, Public Health	Scoping Meeting / Issues and Concerns
(BLM 2014c)	—	—	Subsistence Uses and Resources, Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BLM 2016a)	—	—	Public Health	Scoping Meeting / Issues and Concerns
(BLM 2016b)	—	Vegetation	—	Scoping Meeting / Issues and Concerns
(BLM 2018a)	—	Terrestrial Mammals	Subsistence Uses and Resources, Economy	Scoping Meeting / Issues and Concerns
(BLM 2018b)	—	Cultural Resources	—	Scoping Meeting / Issues and Concerns
(BLM 2018c)	Physiography	—	Economy, Public Health	Scoping Meeting / Issues and Concerns
(BLM 2019a)	Renewable Energy, Petroleum Resources	Birds, Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(BLM 2019b)	Physiography	Birds, Terrestrial Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2019c)	—	—	Public Health	Scoping Meeting / Issues and Concerns
(BLM 2019d)	—	—	Cultural Resources, Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(BLM 2019e)	—	Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(BOEM 2011)	Climate and Meteorology	Fish	Sociocultural Systems	Scoping Meeting / Issues and Concerns
(BOEM and BSEE 2013)	—	Marine Mammals	Subsistence Uses and Resources	Scoping Meeting / Issues and Concerns
(Braem, Mikow, Brenner, Godduhn, Retherford, and Kostick 2017)	Acoustic Environment	Birds	Subsistence Uses and Resources, Sociocultural Systems	—
(Braund, Lawrence, Sears, Schraer, Regehr, Adams, Hepa, George, and Von Duyke 2018)	—	Marine Mammals	—	—
(Brewster and George No Date)	Water Resources	Fish	Subsistence Uses and Resources	—
(Brown, Braem, Mikow, Trainor, Slayton, Runfola, Ikuta, Kostick, McDevitt, Park, and Simon 2016)	—	Fish	Subsistence Uses and Resources, Sociocultural Systems Public, Health	—
(Brown 1979)	—	—	Subsistence Uses and Resources	—
(Carothers, Cotton, and Moerlein 2013)	—	Fish	—	—
(EDAW Inc., Consulting, Research, Callaway, Associates, and Economics 2008)	Acoustic Environment. Water Resources	Marine Mammals	Subsistence Uses and Resources	—
(FEA 1976)	Acoustic Environment, Water Resources	Fish, Terrestrial Mammals	Subsistence Uses and Resources,	Scoping Meeting / Issues and Concerns
(HDR Alaska 2015)	—	Fish, Terrestrial Mammals	—	—

Citation	Physical Environment	Biological Environment	Social Environment	Other
(Mager 2012)	—	—	Subsistence Uses and Resources	—
(MBC Applied Environmental Sciences 2004)	Climate and Meteorology, Physiography, Water Resources	Wetlands and Floodplains, Fish	Subsistence Uses and Resources, Economy, Public Health	—
(McBeath and Shepro 2007)	—	Fish	—	—
(MMS 1979a)	Water Resources	Cultural Resources	—	—
(MMS 1979b)	Water Resources	Terrestrial Mammals, Marine Mammals	Cultural Resources, Public Health	Scoping Meeting / Issues and Concerns
(MMS 1982)	—	Fish, Birds	—	Scoping Meeting / Issues and Concerns
(MMS 1990)	—	—	Economy	Scoping Meeting / Issues and Concerns
(MMS 1997)	Acoustic Environment	—	—	Scoping Meeting / Issues and Concerns
(MMS 2001a)	—	Terrestrial Mammals	—	Scoping Meeting / Issues and Concerns
(MMS 2001b)	—	Fish	—	Scoping Meeting / Issues and Concerns
(MMS 2006)	—		Public Health	Scoping Meeting / Issues and Concerns
(MMS 2007a)	—	Birds, Terrestrial Mammals, Marine Mammals,	Subsistence Uses and Resources	—
(MMS 2007b)	Acoustic Environment	Marine Mammals	—	Scoping Meeting / Issues and Concerns
(MMS 2007c)	—	Fish	—	Scoping Meeting / Issues and Concerns
(MMS 2009a)	—	Fish, Terrestrial Mammals	Public Health	Scoping Meeting / Issues and Concerns
(MMS 2009b)	—	Marine Mammals	Sociocultural Systems, Public Health	Scoping Meeting / Issues and Concerns
(Spearman and Nageak 2005)	—	Fish	—	—
(SRB&A 2003)	Acoustic Environment, Solid and Hazardous Waste	Fish, Birds	Subsistence Uses and Resources	—
(SRB&A 2009)	Air Quality, Acoustic Environment, Physiography, Water Resources, Solid and Hazardous Waste	Vegetation, Wetlands and Floodplains, Fish, Terrestrial Mammals	Landownership and Uses, Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems, Economy, Public Health	—
(SRB&A 2010a)	Acoustic Environment	Fish, Birds, Terrestrial Mammals	Subsistence Uses and Resources	—
(SRB&A 2010b)	—	Terrestrial Mammals	Subsistence Uses and Resources, Sociocultural Systems, Economy, Public Health	—
(SRB&A 2011a)	Climate and Meteorology, Water Resources	Fish, Birds, Marine Mammals	Subsistence Uses and Resources	—
(SRB&A 2011b)	Acoustic Environment	Terrestrial Mammals	Subsistence Uses and Resources, Visual Resources	—

Citation	Physical Environment	Biological Environment	Social Environment	Other
(SRB&A 2013a)	Climate and Meteorology, Acoustic Environment, Solid and Hazardous Waste	Fish, Terrestrial Mammals, Marine Mammals	—	—
(SRB&A 2013b)	—	Terrestrial Mammals	—	—
(SRB&A 2013c)	—	Wildland Fire, Fish, Terrestrial Mammals	Subsistence Uses and Resources	—
(SRB&A 2014a)	Solid and Hazardous Waste	Terrestrial Mammals	Subsistence Uses and Resources, Visual Resources	—
(SRB&A 2014b)	Climate and Meteorology	Fish, Birds, Terrestrial Mammals, Marine Mammals	Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems	—
(SRB&A 2015)	Petroleum Resources	Terrestrial Mammals	Subsistence Uses and Resources, Sociocultural Systems, Visual Resources, Public Health	—
(SRB&A 2016)	—	—	Subsistence Uses and Resources	—
(SRB&A Unpublished-a)	Climate and Meteorology, Physiography, Water Resources	Vegetation, Wildland Fire, Fish, Birds, Terrestrial Mammals	Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems, Economy	—
(SRB&A Unpublished-b)	Climate and Meteorology, Air Quality, Acoustic Environment, Physiography, Paleontological Resources, Water Resources	Vegetation, Wetlands and Floodplains, Wildland Fire, Birds, Terrestrial Mammals	Cultural Resources, Subsistence Uses and Resources, Sociocultural Systems, Public Health	—
(USACE 1983)	Acoustic Environment	—	—	—
(USACE 2010)	Acoustic Environment	—	—	Scoping Meeting / Issues and Concerns
(Wolfe 2013)	—	Marine Mammals	—	Scoping Meeting / Issues and Concerns
(Worl and Smythe 1986)	—	—	Cultural Resources, Sociocultural Systems	—

3.2 PHYSICAL ENVIRONMENT

3.2.1 Climate and Meteorology

At my home I have a barometer and have learned how to read it. This year and the past few years, I have noticed changes that occur. The barometer would indicate that a wind from the west would be coming and then out of the blue an east wind would come and vice versa. So it seems like our weather cycle has done a circle. So what is occurring with the weather is actually opposite of what the barometer is indicating that it should do. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

It's unpredictable nowadays. Sometimes we wait and wait for the wind to die down before we go out boating. The last time they brought the whale in those boaters were really wet. Well [the ice] is not as thick as it used to be. We hope that the ice doesn't break off when the wind [comes in] from the northeast. (Wainwright) (SRB&A 2013a)

Easterly direction wind, we're going to be shallow…. East wind we get shallow waters. Westerly winds, southwest winds will push it in. (Point Lay) (SRB&A 2011a)

It's taking longer to become stationary ice. We can have an open ocean in January because the wind has broken it up. We can have big piles of ice on the barrier island. (Point Lay) (SRB&A 2011a)

And just being a hunter, I've noticed the ice is not as thick as it used to be. We're losing two weeks out of the year in the spring, thawing out too early. And then in the fall time, we're gaining over two weeks before it freezes up again. (Utqiaġvik) (BLM 2004f)

The past five years have been very unusual. There has been an early spring thaw out. We would be boating when it wasn't the time for us to be boating. This weather has been a phenomenon. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

I am now 82 years old and can remember since the time I was 9, when there used to be slow transitions from cold conditions to warm conditions. Now, these transitions from cold to warm are fast and abrupt. Fall used to freeze fast and now it is the reverse, the fall freeze is slow. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

A long time ago the Elders, when she was able to remember her surroundings, our Elders have spoken that the earth was going to shift. It is shifting today. Climate change in the Arctic, blizzards, snowstorms in the Lower 48, those are the kind of changes that the Elders have spoke of. And I, for one, I am witnessing this today. One day we will not have any winter. There will be no winter on this Arctic. The North Slope is going to be like Lower 48, ice and snow free. We will be able to travel year-round by boat. There will be vessels out there, either for industrial or commercial, which will be open. And it's already opening. (Nuiqsut) (BOEM 2011)

Of course, the ice has changed. [Hunting partner] and I used to go out and find pack ice, and it was different weather. It would have its own weather. Gray and wet and windy. It was less long and 30 feet high. We haven't seen that for 20 years. We've seen ice that's eight to 12 feet thick on top, which means it's 30 to 40 feet below. That's out deeper or it gets grounded. There's still that kind of ice going by and it's doing some gouging. It gets stuck. We're looking for ice that gets stuck because that's where the ugruks are. Near any inlet you can get in behind it but not too far. (Point Lay) (SRB&A 2011a)

The only thing that I'm worried about is the ice conditions, the thickness of the ice, we're getting less. Ever since about three years ago I started noticing it. Taking a little longer to freeze out there. A lot longer this year. Usually we won't see any open water out there for a mile. This time of year, we seen a lot of open water. Usually the whole area is just solid ice where we can just travel by snowmachine and not worry about falling through. (Point Lay) (SRB&A 2014b)

The ice is, like, an inch lesser than it used to be. When you fish lots, you notice the difference. That's been in the past three, four years. The water levels in the rivers are lower than what they used to be when it freezes. About six inches lower than it used to be. The lagoon ice used to freeze over six feet. It used to take us hours with an ice pick to get a hole. And now it only takes about a half an hour, 45 minutes. We check the ice ever year, and we've been busting through to water at four feet, and it used to be six feet. That's in January when the sun comes back; we go do the check for the ice, the thickness. (Point Lay) (SRB&A 2011a)

About five years ago [the ice started changing]. You can tell it's just getting less. I hope there's more ice this year, or next year. We'll see, we'll measure the ice. The ice we got that whale on, the whale wasn't supposed to go on the ice [because it was so thin], but we actually got it up. (Point Lay) (SRB&A 2011a)

[The weather is] changing [and becoming] warm. [It is] warmer up north, [in] Barrow. In Nuiqsut [the weather] don't change that much. But Barrow, it's warmer than this place! People they talk about it. They say the weather is getting warmer. Now it's down to 20 below. Or 35 [below] or so. I don't know what makes the temperature change in winter. Those people down Barrow they talk about "it's getting warmer and warmer every year" down there. I don't know from what. It used to be c-o-o-o-o-ld! Changing something, I don't know. (Anaktuvuk Pass) (SRB&A Unpublished-a)

There's been a different winter, in which there was a sound that was like a big bang and all of a sudden there was a storm that sets in. You couldn't even see across the street to the outhouse. (Anaktuvuk Pass) (SRB&A Unpublished-a)

This year we got a lot of snow, more than usual. You can tell, there's a lot of little snow in areas and now it's way up drifting. Where you're camping in those places, you used to camp right next to the hillside, now it's drifting every year. I think snow is getting more and more. Snow this year, there is a lot all over. This year we had a bad one. [It has been] snowing every day. I came down every morning and say "it's snowing again?!" We got a lot of snow all over. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Melting, the climate. Global warming. Those ponds are not just forming but drying out. Permafrost shifting and melting more heat I suppose. Not evaporating and draining. In the last few years. I know it happens but it seems to be happening in the last few years. If you go to a lake that you know to be deep or a hole or anything, when you come to the edge of it has gone down on the edges. I would say throughout up here to Barrow and Deadhorse. (Nuiqsut) (SRB&A Unpublished-b)

It, the weather that has caused the water temperature to rise. Because of the tundra up here is hot. It affects the water and the river flows into the Beaufort Sea and today it is a lot warmer than it has been in the past. It is changing with the climate change that we are experiencing. (Nuiqsut) (SRB&A Unpublished-b)

When I was growing up the weather was a lot warmer in both summer and winter. During the years past it has changed to where… in March when I was growing up the weather would start warming up. In like November, December, January, February, that would be the coldest part of the year. Today they still are but March is to. It is unusual to see something like this, where it is over 50 below to where it is cracking the tundra in March. When it cracks it makes a lot of noise, it never used to do that when I was young today it is changing. Our weather is so different compared to what I observed in the 40s and 50s. Today we don't have any [prevailing] wind directions. (Nuiqsut) (SRB&A Unpublished-b)

The changes are due to possibly climate change. It was bound to happen because our elders have been speaking about it. They would think that there would never be blizzards or cold fronts. I am surprised there is a cold front now. It is very unusual to have weather like this without wind. We don't have, we don't know if there is going to be a blizzard or not. It used to be a lot warmer and windier when we were kids, today it is different. As for the ocean current I cannot speak to that, because that is for men to speak of. I can speak on the land issues because that is what I have experienced. (Nuiqsut) (SRB&A Unpublished-b)

In the fall time we get real strong winds, and then again in the winter. Last year we had 75 mile an hour winds in town which was pretty crazy. It doesn't happen all the time. Not really anything new. It is what you expect when you live up here. Sometimes it gets a little bit warmer when it gets windy, and when there is no wind at all it can be like 80 below with no wind. When it got windy it warmed up. It pushes all the wind from down south, it depends on the direction. It will get windy on the coast, if it is nice here it can be windy out there. You go to get away from the mosquitos. (Nuiqsut) (SRB&A Unpublished-b)

Back then we used to have more thunder clouds more thunder more rain more massive flooding and a combination of hail storms that we would see when we were young. Today we don't see that, those thunder storms we would see in the past and hardly any of those hail storms. It seems like they used to have more in the area. The weather pattern is changing every season. Hail storms usually started in August and September and those times used to be a rainy season and now it seems like it is a lot warmer. During my time it was hot with a lot of thunder storm... Now we hardly see those types of storms anymore. We used to have massive blizzards but today we hardly have any blizzards. (Nuiqsut) (SRB&A Unpublished-b)

Back then we would have massive amounts of snow; lots of blizzards and a lot of snow. Some of the areas on the river bank and the slopes would be covered in snow and those cliffs up there [Colville Bluffs?] are strait down and those cliffs would be gradual slopes with all of the snow. Today you don't see many blizzards and less snow overall. There are changes within my lifetime. We see less snow less blizzards and less snowfall today. That is why we have less water during the breakup time. (Nuiqsut) (SRB&A Unpublished-b)

We get less [snow] storms now. What I'm thinking is global warming, because down states they're getting all the snow. Before I left Anchorage, it got 16 inches. Here, we finally got some snow. Couple years, four years ago, we got every street filled to the housetops. You couldn't even see the truck going by. [There were] walls of snow. The school bus, you could only see the school bus that much [over the top of the snow]. It's

more like getting colder and colder and some days it will get warm, and when you look at the lagoon you would see some [open] spots. (Point Lay) (SRB&A 2014b)

3.2.2 Air Quality

See traditional knowledge provided in the PUBLIC HEALTH section for traditional knowledge that is also applicable to this section.

Yes, we always see it every year. A haze, a dirty haze in the winter, all the haze goes down to ground level. (Nuiqsut active harvester; Experience timeline: 1980 and ongoing; Experience location: Kuparuk on over to Nuiqsut. SRB&A Interview 2007). (SRB&A 2009)

This fall I went out boating. I drove into a haze just off the Point (Barrow). It gave me a headache. It only stayed a few days until the wind blew it out. A big old, yellow cloud. I thought it came from the east, the oil field area. (Barrow active harvester; Experience timeline: 2006; Experience location: Pt. Barrow. SRB&A Interview 2007). (SRB&A 2009)

Our air quality is a concern. The industry is moving closer to us. They are burning waste oil and natural gas. This is in combination with what is coming up from down south with the warm air and then dropping down in the cold air. (Barrow active harvester; Experience timeline: 2001 and ongoing; Experience location: Barrow, Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Air quality compared to how it was a long time ago has gotten a lot worse. I never notice the yellow haze around Nuiqsut when I was a kid. I started noticing it when Alpine came. I know when we are getting close to Prudhoe and that's how I know when I am getting close. When we drive there. We would go to get gas and see the yellow haze, now it is all around here now too. One of my aunts, she was a community healthy aid. She has noticed a lot of asthma in the last few years and that it's on the rise. You can see it on YouTube, she talks about all of that. (Nuiqsut) (SRB&A Unpublished-b)

The air pollution too. You can see it on a real nice day. There is a yellow haze if you look out you can see it. You probably could see it now. It's that way. Even in summer time you can see it too when it is a nice sunny day and you can see that yellow stuff. (Nuiqsut) (SRB&A Unpublished-b)

The winds too, they go back and forth a lot of the time. I have seen the wind change direction really quickly it seems like it all blows back to the same spot. If you can see the smog out there you know that it is somewhere in town. If you drive on the dump road past the natural gas station and you have your heater on in your truck it will suck it into your truck and give you a headache. You will smell the natural gas every time. All the toxins and carbon monoxide, when you release the pressure you see a big flame up in the air. All that exhaust we are breathing that I know. (Nuiqsut) (SRB&A Unpublished-b)

Sometimes it will look darker and sometimes it will look lighter. Occasionally I will look out and it will be brown instead of yellow. I think that the winter is worse because there is no moisture in the air so all of the toxins just hang out there. You can tell if you stay here the whole winter and then summer comes around and it's different. (Nuiqsut) (SRB&A Unpublished-b)

At Alpine. It's about this time of the year that you start seeing that yellow haze and black smoke from the industry. All the way to Prudhoe Bay. You can see that yellow haze, it looks almost like lights. On the east side to by Oliktok and towards Kuparuk. And there might be some offshore at Northstar and Endicott. Those were also traced some particles going out. (Nuiqsut) (SRB&A Unpublished-b)

When they do flare ups all of the chemicals that they are dividing from the oil, and what has to be re-burned. Not all of it is burned. It is blown away before it even starts burning. Some of those fluid, chemicals are blown by the wind so it is carried elsewhere. They call that a flare up every time there is a lot of pressure or when they are separating oil or a lot of chemicals. It has to be cleaned, and divided with sand/silt/water. Other chemicals that are combustible are flared up. Some of it is not burned it is blown elsewhere. And also the acid rain that brings down those chemicals. (Nuiqsut) (SRB&A Unpublished-b)

It seems like there is a lot of smog lately. It seems like there is a lot of pollution. (Nuiqsut) (SRB&A Unpublished-b)

3.2.3 Acoustic Environment

Noise Effects on Subsistence Activities and Resources

See traditional knowledge provided in the SUBSISTENCE - NOISE, TRAFFIC, AND HUMAN ACTIVITY section for traditional knowledge that is also applicable to this section.

Onshore/Terrestrial Areas

The fact that we are not used to it (noise) affects us. I know more of the traditional hunters would much rather have it how it was, the quietness. You could hear the animals coming in, maybe the sounds geese and ducks make. And not just the sound but the smell. Walrus' for one you can smell. You can also smell the algae that comes up from the sea bottom and gets green. When that happens you know there is some kind of marine life out there. Waterfowl or maybe seagulls. (Nuiqsut) (SRB&A Unpublished-b)

The concern I have is with [my aunt]'s fish camp there. It's right by Alpine. And it upsets us because they run those airboats, on land and water and the noise scares off our game. They run wherever they want to with those choppers too. My aunt calls 'em noise makers. We can't pick eggs no more because they disrupt the birds and other game too. (Nuiqsut active harvester; Experience timeline: 2000 and ongoing; Experience location: Nigelik Channel. SRB&A Interview 2007). (SRB&A 2009)

When we were growing up we were always told to keep quiet. They can hear very well. We were taught this from our ancestors. We were told not to yell or holler. They can hear very well. (Wainwright active harvester; Experience timeline: 1951 to present; Experience location: Wainwright. SRB&A Interview 2007). (SRB&A 2009)

Just to recall back in my time when we was in that area fishing with a hammer - you could use a hammer to strike right on the ice -observing the fish below you - you can strike right on the ice itself, stun the fish and kill it and kill it. That's how sensitive a noisemaker would be in any of these areas. I would say that permafrost would have the same effect, the detonation of a strong impact could be used in the permafrost. (Utqiaġvik) (FEA 1976)

First time [I experienced an impact] last year was when I saw a couple of airboats up there [Nigliq Channel]. You can hear them things for miles and miles. I've heard people complain about them when they go up river. That was in late May right before it broke up, that is when they start with the airboats and then they are there throughout the summer, on the main channel. There's just so much activity going on with the oil company, they are just trying to check up on everything, make sure there's no spills or nothing. (SRB&A Nuiqsut Interview May 2010). (SRB&A 2010a)

Airboats, they got airboats that are too loud [whole delta area.] That is every summer, July, August, end of June. You can hear the airboat before you ever see it. One time we had an accident a couple of summers ago, and we needed an assist from Conoco Phillips, a guy [fell] in the river, and we heard this thing coming, and it was so loud that we could hear it before we could ever see it. They do exercises, like a lot of oil-spill exercises. It's too shallow for [other kinds of boats] like they could use a jet unit, but they use an airboat for when it's too shallow. They have no access other than the use of the airboat. And then sometimes down by CD4 you will have an airboat and a small medium cargo boat, there is a little slough in there by CD4 and that's the one that they want to dredge in there and try to get into the lake, and then they could use that as a staging area as a possible use for area for oil spill response, but the community said no and then they rejected the application for the permit for that. (SRB&A Nuiqsut Interview May 2010). (SRB&A 2010a)

What they mentioned about the noise, and I guess that's why the fish are not coming back or they're depleting. That's one of the things you should study or monitor as you said. This drilling, you can barely hear it up, you know, up on the ground, but down it goes deeper and, you know, noise travels further especially I guess if it's close to the water. And I'm just saying that that could be the cause. And, as you may or may not know, we all love ahnalik here and we need it, too. So we need that for our subsistence. (Utqiaġvik) (BLM 2003a)

The air boats, every time they go do their surveys, or checking their Conexes, they disrupt anything that is there and us too. And the caribous will take off, or the seals will pop down; anything that is near that [noise], they take off. (SRB&A Nuiqsut Interview April 2010). (SRB&A 2010a)

They have those airboats that do that training. We do have a lot of airboats down there. They have access to a boat ramp at CD 4, and then you have those zodiac boats that come around from CD3 and they come around and go in this channel. I've seen how many that come around and go in. It has to be in this area. They come out from these two [channels]. And you know that the community is not informed about when they are going to have an exercise about those airboats. If we would know, that would inform our hunting. And now they have a bigger one [airboat] that is bigger than the two-seater. They are louder than the planes [airboats]. You could hear them before you could see them. That is a concern to the area. That would be during the duration of the summer. Sometimes it could go later, like mid August. (Nuiqsut) (SRB&A 2010a)

I've got my camp down there [on Nigliq Channel]. There is always traffic through the river all through the summer, the loud boats all summer. And across is my brother's [cabin]. They drive around until September (June through September). They always come from somewhere from the ocean and then the go through the river all the way to Nanuq, and then they always go back out. (Nuiqsut) (SRB&A 2011b)

Plenty [of traffic]. Especially those boats with loud noise. Go through my allotment every summer. Really loud, you can hear them from a distance. Airplane, helicopter fly everyday. Even small planes, sometimes, Summer, in summer, mostly always fly. They always go through towards Fish Creek, land by my allotment, helicopters down there. Every summer, in July, June. I never see much in August, I always go up river moose hunting. They got three of them [airboats]. They can go through the shallow water. Lots of noise. Some of them get spooky. That noise is no good for an animal. Yeah, when some of the caribou get spooked, they run off. When they get spooked the just start running away. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010a)

I think I've heard that concern now from two other persons that directly told me that the existing seismic is already impacting subsistence hunters as we speak, that the seismic area has no game. The impacts, like Harry said, has scared and run the game off in one direction from that area already and numerous trips made by at least half a dozen hunters have attested that, that they've gone from the east side of the Ikpikpuk and Chipp River to the west side, where they're not there in that seismic area anymore. So these people have purchased gasoline and planned their trips just to find out that the seismic is in that area already and went up to those areas of normal hunting and the game is not there. So I just wanted to support Harry's comments in that sense. (Utqiaġvik) (BLM 1997a)

Humming coming from the infrastructure and facilities. If you are in proximity you hear it. 2-3 miles. And there are some occasions that they are flaring up their gas how they flare up and you can see a big flame and hear it too if the wind is right and it is coming this way. (Nuiqsut) (SRB&A Unpublished-b)

Some of the animals behave abnormally. Anytime they hear a noise they gather in a bunch. They don't know which way to go. I guess when they build the ice roads, all the noise and lights causes them to behave differently. When you get them by surprise, they know what way to go, but if you get in front of them, they bunch up and wait on you. (Barrow active harvester; Experience location: around Barrow area and further inland. SRB&A Interview 2007). (SRB&A 2009)

You know I just wanted to mention what some of my personal observations with what's happening with that seismic out there and that seismic displacing the animals, I just wanted to pass this on for your information and I didn't see any furbearers except for the foxes, the red foxes and the different faces anyway. I didn't see no wolves out there, no tracks or anything like that. I was on my way back home just this Saturday and met up with my cousin and he just said, yeah I just ran into a set of wolverine tracks and followed them 26 miles one direction, and he didn't take a close look at the tracks and he started following the trail and it had just been scared away from where the activity was occurring, which was up on the tops against that southeast side of Teshekpuk up in this Pikes dunes out there and he found the den and the rig had just gone by. I just happened to be there when he was following the trail and coming back, he said he just followed the trail 26 miles one direction and the wolverine had just made a bee line from where the seismic activity was going on, it had been scared away from its den, it was just moving out. And there was no caribou in the area, well you know I'd seen that, I made these trips up to my cabin, it's up and the Ikpikpuk River and I've observed the displacement of the wildlife over the winter. I've been going back and forth since December to just last week and I've seen the different areas where they've been over the winter, and I just wanted to bring that out, of my personal observations where, and I just wanted to back up what Noah and what Warren was saying about, you know, I'm

not going to be opposing any development or the different phases of the development. I just want to put that on record. (Utqiaġvik) (BLM 1997a)

They tend to drive the game away. The caribou in particular, not so much the fish. They migrate all the time. The caribou are moved off by the noise. In September when they're all fat, the same with the spawning fish. In the early 1980s, rollagons, seismic crews, and ice roads started. I hunt wolverines and wolves in winter, occasionally. But there are so few wolverines now, maybe because of the noise.... I do a lot of geese hunting; they're not as affected by the seismic crews, even when they're nesting. I do that in spring, right after whaling. Now they came up with that bird flu, I hope I don't get that! (Barrow active harvester; Experience timeline: 1982 and ongoing; Experience location: by Teshekpuk, south end in the river. SRB&A Interview 2007). (SRB&A 2009)

I do a lot of fishing. It will certainly change the migration of fish through gravel extraction or adding on. I have seen when the barges dock out here, and all the noise pollution from the engines. We all know that water is a good conductor for noise. As sensitive as they are, any noise will affect the migration route. The gray whales and belugas go to a certain point, and then go around it. This affects the fish species as well. During the storms and the barge dock, I have a net out by the point in Elson Lagoon. I get less fish. When the barges leave, I get more fish. (Barrow active harvester; Experience timeline: 2002 and ongoing; Experience location: Elson Lagoon. SRB&A Interview 2007). (SRB&A 2009)

Nearshore/Marine Areas

When a captain came in to talk to me, I knew he was going to say that the whales are displaced [by noise] farther than you scientists think they are. But some of them would also talk about 'spookiness'; when the whales were displaced out there and when the whaler would get near them, they were harder to approach and harder to catch (USDOI, MMS, 1997, USDOI, MMS, Herndon, 2001 [2002-2007 5-Year]). (Utqiaġvik) (MMS 2007a)

A lot of whales are traveling farther out than before. Five years ago they would go right off the point; now it is 20-30 miles. Too noisy, there has been a big change since seismic activity. (Utqiaġvik) (EDAW Inc. et al. 2008)

Twenty-two years ago, the Federal Government refused to listen to our people on issues related to the size and health of the bowhead whale population. Yet today, after the millions of dollars the North Slope Borough has had to spend on this, they must acknowledge that our Whaling Captains were right all along. Again, seven years ago, we were ignored [when we told the National Marine Fisheries Service and ARCO Alaska that seismic noise caused the bowhead whale migration to deflect off shore]and again millions of dollars were spent to find that, again, our Whaling Captains were right. Despite this history, when we speak today on issues related to bowhead whale behavior, we continue to be scoffed at or ignored. I ask you, how successful would a bowhead whale subsistence hunter be if he did not have an intimate knowledge of the whale's behavior? (Utqiaġvik) (EDAW Inc. et al. 2008)

Of all the animals that I've known, the wolves are, when you are hunting them, they're very noise sensitive, but more so are the bowhead whales. Any noise that they hear, they respond to that by going, moving away from it. A lot of times polar bears are different.

Their curiosity can kill them very easy. They go toward the noise or anything that moves, they go for that. (Nuiqsut) (SRB&A 2003)

Noise redirects marine mammals away from shore and toward the ice pack. It makes it more dangerous for hunters. (Wainwright active harvester; Experience location: offshore Wainwright. SRB&A Interview 2007). (SRB&A 2009)

Industrial noise, vibration, aircraft, including choppers. They're way louder than airplanes. I guess the animals always hear the noise and they go further out. We used to go out and there'd be a lot of seals out there. Now we have to further out to get them. Ugruk too. We used to go to Imaliktuk Island (Eider Island) when the weather gets real bad, but that place is real close to that oil island, and now they don't want us going there without escort; or we might have a barrier we can't go past, like a line. It's just really noisy now. Before Alpine was built it used to be nice and calm and you could just hear ice. Now, during the summer, when they're real active you could hear them 20 miles away and the noise travels better on the ocean than on the land. You can really hear it. (Nuiqsut active harvester; Experience timeline: since 2000 and ongoing; Experience location: Alpine/Eider Island. SRB&A Interview 2007). (SRB&A 2009)

One of the real concerns that we've got with this type of development is noise. Noise is something that maybe two or three years ago was much quieter all respects than now, but people are becoming much, much more concerned about the influence of noise on particularly the migratory route of the bowhead, and a lot of this happen to be related to a very clear situation that seems to be developing here in Barrow, and that is that since 1977, I think it is, there's only been one bowhead caught here in Barrow in the fall time, and from talking to a fair number of whaling captains here in Barrow, the feeling is that the animals in the fall are just steadily moving further and further out to sea off of Point Barrow. Thomas Albert. (Utqiaġvik) (USACE 1983)

And that the whales are sensitive to seismic sounds, to drilling sounds, to ship sounds, et cetera, et cetera. So the concern, of course, is, especially with barging, is why I asked about the timing of the barges, that the potential for the tugs that are pushing or pulling the barges, as well as the barges themselves, very feasibly will deflect bowheads. And so there's a concern about the subsistence hunts in Kaktovik, Nuiqsut and Barrow, and making sure that those hunts aren't disrupted, but also making sure that impacts to the whales themselves and to the kinds of the survival reproduction of the whales is not impacted. Robert Suyden. (Utqiaġvik) (USACE 2010)

The noise impacts have a devastating effect on fall whaling as demonstrated during the 1989 fall hunt in Barrow. All the meat was lost because our hunters had to go to great distances to hunt due to industrial activity east of Barrow. -Karen Burnell. (Utqiaġvik) (MMS 1997)

The whales are very sensitive to noise and water pollution. In the spring whale hunt, the whaling crews are very careful about noise. In my crew, and in other crews I observe, the actual spring whaling is done by rowing small boats, usually made from bearded sealskins. We keep our snow machines well away from the edge of the ice so that the machine sound will not scare the whales. In the fall, we have to go as much as 65 miles out to sea to look for whales. I have adapted my boat's motor to have the absolute minimum amount of noise, but I still observe that whales are panicked by the sound when I am as much as 3 miles away from them. I observe that in the fall migration, the bowheads travel in pods of 60 to 120 whales. When they hear the sound

of the motor, the whales scatter in groups of 8 to 10, and they scatter in every direction (NSB, Commission on History and Culture, 1980; USDOI, MMS, 2003a). (Utqiaġvik) (MMS 2007a)

And the other thing is when it comes to the sound, we know from our ancestors, from history, from our Inupiat history that they didn't dare go near the ocean once -- they didn't even speak above a whisper because the whales were so sensitive to noise. This is documented. And I just listened to some whaling captain saying -- and I never thought of it when my brother's whaling crew that I'm a part of go down every year, where they urinate, you know, have a little bathroom area there, that this one crew didn't even let it accumulate because the whales and the animal smell was so sensitive. They can smell real sensitive. Dorcas Stein. (Utqiaġvik) (MMS 2007b)

Noise Levels and Effects Associated with Aircraft

See traditional knowledge provided in the SUBSISTENCE - NOISE, TRAFFIC, AND HUMAN ACTIVITY section for traditional knowledge that is also applicable to this section.

When we had the helicopter and the coal mine open, we had no caribou close to Point Lay at all, anywhere. All year round. For how many years…so then we started making rules and regulations for air traffic for the coal mine so we set down how high helicopters and airplanes could fly, and they're still going on to this day on these studies. Even with the walrus, the helicopters and the airplanes have to stay above 1500 feet or more…after our coal mine shut down, we noticed the caribou migration slowly started coming back, and then I say these past 2 years is the most I ever seen caribou hanging around Point Lay [since before the activity]. Not in herds but just in little pods—maybe 5 pods, 7 pod, 10 pod. But at least they're hanging around now. (Point Lay) (Braem et al. 2017)

Mainly aircraft over-flights. They've kind of been scaring the caribou. Last year I was waiting for a herd coming towards the river. And then that BP twin otter came over, maybe 2,000 feet off the ground, and those caribou turned right around and headed a different direction. (Nuiqsut active harvester; Experience timeline 2006; Experience location: Between Kokumak Channel and Colville. SRB&A Interview 2007). (SRB&A 2009)

There was a plane yesterday that was flying really low that we were wondering about. It kind of looked like Era's caravan, but it wasn't at the right time. We were wondering what was going on, and we got mad cause there was caribou out there that they were scaring. They were flying lower than the street poles. (Point Lay) (SRB&A 2013a)

Especially in the Alpine area. You can hear them in town. It will scare the caribous. They will be easily spooked for days. They will just start running and keep on running and running. With that chopper it likes to go on the rivers and around here the way the rivers are there are two river split apart and then go together and the caribou are in the middle. And the birds are trying to avoid the activity and noise. (Nuiqsut) (SRB&A Unpublished-b)

With caribou, this summer there was a chopper going around. It was about 40 miles west and south of Barrow. That chopper, they were so spooked. The helicopter scared the caribou. Maybe they think all the noise from the rotors is gunfire. When you're out there for a couple weeks hunting and the game keep getting scared off, it gets old.

(Barrow active harvester; Experience timeline: 2006; Experience location: Southwest of Barrow. SRB&A Interview 2007). (SRB&A 2009)

Planes. We were at our camp, choppers and planes were scaring caribou. We had to go further out. About 35 miles southeast of here, near our camp. (Barrow active harvester; Experience timeline: 2006; Experience location: small lakes out there [Barrow area]. SRB&A Interview 2007). (SRB&A 2009)

When we were way down by the Chandler area and there was air traffic going on over here at Umiat and that red and white plane of Alpine kept following the river and scaring the caribou like he is doing it on purpose. We have bright clothes on and he knew we were there and he made a couple passes and made the caribou run further inland. That was wrong. Red and white plane. We had the caribou in our sight and plane comes and it took off and turned back around and did the same thing and same path and that pissed us off. Right between those two rivers. Just following the river. We had the caribou in our sight waiting for a good shot and we heard the plane and they just took off. That was in July. Red and white, Alpine. Four boats waiting for them caribou. (Nuiqsut) (SRB&A 2010a).

3.2.4 Renewable Energy

Several traditional knowledge observations in the reports discussed the renewable nature of subsistence resources and the importance of preserving and utilizing these "renewable" resources.

We, the Inupiat people in Atqasuk and the Arctic Slope and Barrow that have survived and rely on subsistence resources to sustain our livelihood. Even today these include the residents of Wainwright because they are heavy users on the renewable resources form Ikpikpuk to Wainwright to Colville River. And we need to maintain these protective setbacks for stipulations on our renewable resources on which we have survived and maintained our subsistence livelihood, and support those persons that are in need of subsistence who are trying to draft these stipulations and protect our renewable resources in the advent of oil and gas exploration in NPR-A. (Atqasuk) (BLM 2004b)

These are the renewable resources that we depend upon for tradition use for subsistence so those are the things that can be funded by these things _____ (59:44.67) gravel roads permitted and potential um renewable resources for our community to protect, enhance our fresh water lakes that have fish bearing lakes. Those are very important lakes and we have to protect in the Teshekpuk area even in the NPRA. (Utqiaġvik) (BLM 2019a)

And for those like himself and those of the community need to also voice more concerns to protect our renewable resources, even in lakes where there are no drainages, because these lakes with no drainages have over wintering fishes, habitat fish habitat, that they -- in these deep lakes. A concern besides that is of the early warming weather, the thawing of permafrost can cause some lakes and have early drainages and may cause some lakes to drain even with fish in it, and that that needs to -- those needs are very sensitive, especially lakes that are near ravines or rivers that should not be encroached upon. And that needs to have a more sensitive protection. (Atqasuk) (BLM 2004b)

3.2.5 Physiography

See traditional knowledge provided in the WATER RESOURCES section for traditional knowledge that is also applicable to this section including comments on permafrost and erosion.

Permafrost

There's reports, recent reports, even at Prudhoe Bay, where the permafrost is even affecting the infrastructure with oil and gas where they had to close down wells because of that. (Nuiqsut) (BLM 2018c)

We are dealing with a lot of permafrost subsidence not just in Point Lay but across the North Slope. I'm sure that, BLM should be aware of that. Having any infrastructure put in place there needs to be a permafrost study put in place first to sustain the infrastructure that's supposed to be put in place to allow for the oil and gas. I think that's a must need that if you're going to build infrastructure up here that you need to look at the land underneath it to make sure that it's stable and able to hold that type of infrastructure. Any special buildings where there's permafrost that is subsiding and you are putting infrastructure there if there's special engineering that is put in place, I want record of that special engineering of that infrastructure. (Point Lay) (BLM 2019b)

I am sure that the melting, or the process of making the soil deeper, with the permafrost underneath, the soil is not very deep. There are times when an area has dropped maybe three feet down and there is ice underneath. (Anaktuvuk Pass) (SRB&A Unpublished-a)

If the sun starts shining on the big rocks, and the sun warms them up, it affects the permafrost when the exposed rocks get warm. (Anaktuvuk Pass) (SRB&A Unpublished-a)

She was mentioning that there is some water [from melting permafrost]; there used to be areas where it's walkable but now it has some deep water. Even in the midst of those rocks there is a lot of water coming, there's water in those areas. And it's staying there in the summer time. (Anaktuvuk Pass) (SRB&A Unpublished-a)

About coastal areas, the ice is being affected somehow by the changing permafrost. There are some areas that are not usable anymore; you know, this methane that seeps out of the ground and if its enclosed in a cellar, people have died in there. You can't smell it, you can't see it, and if you breath it you can die. So the permafrost is getting thinner there is more chance of cracks in it, and if ice cellars are down through permafrost and then they aren't useable anymore. And the water level is [higher] and seeping down and flooding areas. (Anaktuvuk Pass) (SRB&A Unpublished-a)

You probably know how water melts the ice. It eats through it. My experience, I have been going out boating every year and seeing how the land changes. It makes that one area shallow and wider, and the water flows where it can flow the easiest. I have seen a lot of change in the river. It moves a lot of gravel. The routes that we used to use going upriver it used to be pretty deep. Now in my lifetime I have seen the mud move in the river. The gravel and mud will move the water into certain places. There is land, or ground that hasn't been touched in so many years and the mud and gravel will get onto it. Water works really quick on that permafrost. The more it melts the more the ground will start falling in the river. (Nuiqsut) (SRB&A Unpublished-b)

If the water hits it, it will erode the permafrost really fast. If it is just exposed to the light it takes a lot longer than if it is exposed to the water. I have seen dry permafrost stay around for 10 years and not do anything. (Nuiqsut) (SRB&A Unpublished-b)

No, but those pipelines that go over the rivers, now that will affect the river. There are those pipes that they sink that are filled with Freon and they keep the ground frozen. That is the only place I would see permafrost aggravation. Seems like they didn't go far enough away from the river. I bet those permafrost things will begin falling over. (Nuiqsut) (SRB&A Unpublished-b)

Erosion

We noticed changes in the landscape along the river from erosion. We first had a sod house then a cabin. But we had to move the cabin 150 feet from the river because of erosion. We used to have a cellar located 100 feet from the river that eroded away. There was lots of ice [permafrost] where our cellar was and it eroded away very fast. And the water level is coming up higher than in the past when it used to be east winds. The west wind causes the water to rise. The ice movement was so tremendous that it started affecting the landscape and eroding the bluffs. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

With the main ice pack receding, the storms are affecting our banks -- eroding them. Many cellars have been affected by erosion. If the ice pack was nearby, the storms wouldn't be as severe. We used to have a house with land. After so many storms, the door was next to the bank. (Wainwright) (SRB&A 2009)

The ice movement was so tremendous that it started affecting the landscape and eroding the bluffs. The water level is coming up a lot higher than it used to. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

The erosion is more noticeable down there, at the mouth of the Colville [River] down there, I know. Maybe they aren't paying attention to that. People from Barrow do a lot of boating and they say some of those, where they use to go in the small inlets, some of those are just loaded [with silt] and [they] can't use them anymore. I have no information; you have to talk to them. This part here [mouth of the Colville River], or Nuiqsut maybe has more to say about that. (Anaktuvuk Pass) (SRB&A Unpublished-a)

One thing you have to know about building anything around here you have to build it in land to make it last any length of time. We notice all the erosion all the time. It's not a new thing. They have always known about erosion. You have to build further away from the river if you want it to last. (Nuiqsut) (SRB&A Unpublished-b)

Atigaru Point has been eroding a lot. I used to dock at the point and it never got shallow…. (Nuiqsut) (SRB&A Unpublished-b)

… Atigaru Point is now forming lakes and stuff inside the bay too. I see a lot of changes at Eskimo Island, there used to be a small island that was right on the other side of Atigaru Point. Eskimo Island has grown twice or triple as it was back then. It used to be a small island now it is expanding. Either the water has dropped but it is mainly gravel. The high part is tundra. (Nuiqsut) (SRB&A Unpublished-b)

Also that side has erosion control because it is on the oil field side. There are big concrete blocks that protect the coastline from the surf. (Nuiqsut) (SRB&A Unpublished-b)

…I think it is because of the Colville crossing, the bridge they slot it at the end of the season, it seems to the oil companies that it helps but it is still causing flooding. The

water gets so high, I think the bridge, the Colville Bridge is underwater before it goes out. That is probably what causes erosion down that way because of the force of water that is behind it. The currents definitely help with erosion. (Nuiqsut) (SRB&A Unpublished-b)

Where there is ice it is eroding and where there is grass on the tundra there is a change in the weather pattern. Particularly where there is ice it will eroded. Nigliq, there used to be a big mass of tundra but that is gone now. (Nuiqsut) (SRB&A Unpublished-b)

3.2.6 Geology and Minerals

See traditional knowledge provided in the PALEONTOLOGICAL RESOURCES section for traditional knowledge that is also applicable to this section.

3.2.7 Petroleum Resources

Same thing with crude oil, guess what we've been using it for thousands of years. It's called _____ (01:15:32.99) oil seeps that go on the tundra that we harvested and there's a lot of historical knowledge behind that. There's some basis for using crude oil just in its raw form for energy on the Slope. It's a prime topic to be talked about in such a way that Arnold described it a little bit ago. (Utqiaġvik) (BLM 2019a)

Yeah, like a couple of years ago – two summers ago – let's see, right across here [near Kachemach], I have been going to this lake with my boat but now what we noticed is that there is some bubbles are coming up in the lake and we thought, 'that is not fish; that must be methane gas.' One time I took my nephew in there, we were looking for caribou, and I happened to go inside that creek and when we got to that lake, we saw a lot of bubbles coming up. That methane lake. It is right on his aaka's land. We stay away from that area now. I checked it out this summer, and it is still bubbling. (Nuiqsut) (SRB&A 2015)

3.2.8 Paleontological Resources

Also like to view into the realm of paleontology, and emphasize an area I think it's around Ocean Point on the Colville, where there's a large paleontological site that has been investigated for many years by paleontologists from UAF, I just wanted to point that out as an important area. (Nuiqsut) (BLM 1997b)

The Colville River region is very well known for that. We will happen by the tusks, Ivory, bones. I am quite sure that it is over there. (Nuiqsut) (SRB&A Unpublished-b)

3.2.9 Soil Resources

See traditional knowledge provided in the PHYSIOGRAPHY section for traditional knowledge that is also applicable to this section.

3.2.10 Sand and Gravel Resources

See traditional knowledge provided in the PHYSIOGRAPHY section for traditional knowledge that is also applicable to this section.

3.2.11 Water Resources

See traditional knowledge provided in the PHYSIOGRAPHY section for traditional knowledge that is also applicable to this section.

Watersheds, Rivers, and Streams

Teshekpuk Lake Area

> *Teshekpuk Lake is a source land. It is a source land that offers relief, nutrition, rebirth and a health to a culture. It must be respected. This is not your place. It is not my place. So, we must use traditional wisdom here. I did not hear that when I stepped into the room. You spoke of technology, new technology. You spoke of expert science. I want you to leave this room thinking source land.* (Utqiaġvik) (BLM 2003d)

> *And the recent clean up that we did out here, there was so much contaminants that the government did a band-aid job. I was there. I was their operator. I had questions for them, but I was never answered. I asked them why are we doing a band-aid job and how many years of field spill -- then I would not want to see that around Teshekpuk Lake. That's our subsistence, you know. There's a -- I heard there's a big fish in there and nobody caught for years. I heard stories of that big fish that come through the ice, and one day I want to catch that big fish. A big healthy fish, and I wouldn't want it to be contaminated.* (Utqiaġvik) (BLM 2003d)

Other Rivers in NPR-A

> *Ikpikpuk River is a migrating river. It migrates. It moves and sometimes it moves 300 feet a season...What is our -- these boundaries that they are putting at a half mile, three quarter of a mile on the rivers, erodes, I mean, you know, there's some real tough questions in there. But we know that the rivers still migrate. You will see how much the rivers have moved within these years, they've moved miles.* (Utqiaġvik) (BLM 2004c)

> *The Meade River. You see all the ground falling down in the river. Not just there, but other spots. It's getting wider and wider. You can tell. Especially when it rains.* (Atqasuk active harvester; Experience timeline: since 2005 and ongoing; Experience location: Meade River near Atqasuk. SRB&A Interview 2007). (SRB&A 2009)

> *Underneath the tundra, starting from Tavie's [Daniel Leavitt] cabin on the Mayuabiaq, there are a lot of underground rivers. A lot of fish go through there. Those are good fish that come from those underground rivers. Big, fat fish. They're aanaakjiq coming in the mouth of the river. They don't know which way they come from. I've seen them just coming out of the shallow part of the river. They're the best fish from the shallow part of the river. And there's lots of little fish like that. They came from the swamp. They're really good fish.* (Utqiaġvik) (Brewster and George No Date)

> *The people up there would like to see a three mile buffer zone from each side of the river. They don't want to see any roads going across this river. By that, I mean you have three proposed roads going across the Colville and going across Fish Creek on one of these road corridors. There is the initial drilling for the entire NPR-A program that we will be starting soon is based within a few hundred feet from this river. We are adamant and persistent and presume that we should try and stop this because it's one of the most highly prized rivers that we have in the country where the people are concerned. By that, I mean without a buffer zone, where we will protect these rivers, it don't make any difference whether you drill three miles from the ocean shore or fifty miles up the river. It still drains into the entire river stream. Therefore, you have a prevailing chance of destroying the whole river all at one crack. Sam Talak* (Utqiaġvik) (BLM 1982)

We're pretty much contained here, but rivers that are attached to the Colville [River], those are very very important. You know that proposed road [to Umiat]? Those rivers have great value to us for the purpose of not creating, we don't have a lot of fish to talk about but when there are fish they are one of the biggest change of diet, just for a small while. And those are the things that people don't ever look at, and that proposed criss-crossing of those rivers to Umiat, there are five rivers we talk about, and the migratory routes for caribou. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Nearshore Marine

When the weather is warm, [there is an] overflow from ocean, in July. It changes the fish coming in. [I saw that] in [the] last few years. When the overflow from saltwater is coming in [from a west and southwest wind], it coincides with warm spell of the weather. (Nuiqsut) (ABR Inc. et al. 2007)

Before the ice did not break. Now the ice is always breaking. We used to know the currents, when the ice would go in, come out—nowadays, it is unpredictable. (Utqiaġvik) (EDAW Inc. et al. 2008)

When it's south wind we get high water: South to southwest wind. North and northeast wind, everything gets shallow, except for around this time of year [September]. With a slight north wind [in the fall], it won't get shallow in the [Kasegaluk] lagoon. At the beginning of summer it will look like you can walk across almost. (Point Lay) (SRB&A 2011a)

Dirty water, [Kasegaluk] lagoon, the water will be coming in blue, but eventually it pushes all the dirty water and it will slowly turn blue in every inlet. It doesn't happen all at once. You'll end up with a whole blue lagoon. All the blue water will be by the spit side, first, and then it'll take all the dirty water away from the mainland side and turn it blue. (Point Lay) (SRB&A 2011a)

We're seeing first-year ice instead of multi-year ice. Arctic Ocean is melting. Our ice is melting. (Point Lay) (SRB&A 2011a)

We had seismic on the ocean last year and some fishermen don't catch fish anymore. They blame the seismic and air guns because one guy said you were lucky if you get two fish. That was under ice fishing. Usually you get lots. That's with the qaaktaq. This is why I want them to follow the seismic where they blast and see what it's doing to the animals. It'd be better if they search for oil and gas on land rather than the ocean. That way they can have a better chance to work if something happens with their drills. If they have an accident, this way they can cap it. It's easier than in the ocean. Without affecting our hunting areas. I don't want to see any development in our hunting areas or on the rivers where we go fishing. And the calving grounds and bird nesting grounds and any kind of animal that lives there. Their denning grounds. And without damaging the tundra where they work, or lakes that are connected to the rivers. (Wainwright) (SRB&A 2009)

Water Quantity

He's concerned about why a lot of these lakes and rivers are getting too shallow. He's found where they…these seismigraphic testing. He's even seen them at the edge of Tsukpuk Lake and he's…he can't help but blame something like that because there's lakes where they just could put part of a fish net and they will get fish. When they stop

for lunch with just part of a net in the water but now even people try with two hundred foot nets and still don't get that much. There is one lake where you can't find any fish at all. Daniel Leavitt, through interpreter. (Utqiaġvik) (MMS 1979a)

The streams, little rivers, whatever you call them, where they shoot out from Tsukpuk Lake, they used to be able to go in boats in those but they can't even go on them. Some of them less than half an inch of water on them. Daniel Leavitt, through an interpreter. (Utqiaġvik) (MMS 1979a)

The lakes are shallower than what I used to know. They're draining out. Or some of them are just flats now. No water in them. The outlets into the rivers have opened. (Utqiaġvik) (Brewster and George No Date)

There's a difference right now in this river [Meade River]. When I was growing up with my parents, there were thousands of fish here, but now there's fish but not as plentiful as when I was growing up. When I was growing up we used to check the net three times a day and it used to be full, but now they don't get as full. I'm talking about aanaakjiq. When I was growing up this river used to be high tide constantly, but it's draining down. It's getting shallower. That's why I think there aren't as many fish. Since the river is getting shallower here the fish don't come out from the lakes no more. 'Cause there's no more river drainage, or overflow from the river in to fill these creeks. That's why I think there's not as much fish as there used to be. (Utqiaġvik) (Brewster and George No Date)

I remember when the delta was deeper, in 1940, and now it is shallower. When the water is shallower during the winter, the delta freezes and gets grounded therefore there are not so many fish around. This year there was a lot of west wind and more currents; therefore there was good fishing. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

When it snows before it freezes, it causes slush to block the mouth of the river; we move [our] nets; the current pushes the slush toward mouth, the mouth is shallow; it leaves snow at the mouth of river when the wind comes from the west. (Nuiqsut) (ABR Inc. et al. 2007)

The ice has changed, even Contact [Creek] that comes through the village. Kids use to go to the end of the creek and get little fish, but this fall, but this summer it never emptied; it used to dry up in August. It never happened until October so that affected the ice formation on the river… …There must be some warmer water someplace that keeps it running and the water temperature has risen; the temperature of the water probably has changed. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Back then the river was the same as it had always been. It has never gone down below the level. Today it has changed. The river is shifting and the river is getting shallower and further up there are sandbars that are getting higher and higher. Some of the creeks that connect to the lakes… unable to go in those creeks for fish or whatever they are subsisting for. For the Colville River it is changing a lot. The pattern of the current is shifting because the rivers are not one strait deep way, today we have to maneuver around the sandbars. I noticed that the rivers are getting wider because of the current is pushing the water down river, that current is shifting. (Nuiqsut) (SRB&A Unpublished-b)

In 1973 I moved here from Barrow I was originally from Atqasuk and Barrow and we moved here by snow machines. There was nobody over here at that time. One year here, more than that, I know so many times we would take the shortcut to the Colville River using the Putu (main access channel in the 1970s to get to the Colville), today that river is dry. It is all dried up. We used to use that as a shortcut to go way up there. (Nuiqsut) (SRB&A Unpublished-b)

I think it was three years after we came from Barrow. It started drying gradually and then it came to a point where it was no longer access to the Colville by boat… Back then we noticed that we used to have massive flooding and that is because there was a lot of water coming down from the foothills and mountains but now we don't see that much of it. One summer we had a massive flood, it changed when we first got here, there used to be massive flooding as time goes by, gradually, it has changed to where it is drying. The water level has really gone down from what it was in 1973. That is why the Putu has gone dry because gradually the water level has gone down. It is not like we have those massive floods like we had in the past. We hardly see that today. It has so changed. It is hot, [in July] the temperature has changed because the sun is a lot closer and the moon is a lot closer to us. July is when it gets really hot. That is about the time of the year when the Colville gets hot, the river gets warmer too. (Nuiqsut) (SRB&A Unpublished-b)

Chandler River has changed in the past. It used to have access going in and our but today it is all gone and it is shallow. For some reason it has gone down and we don't have the same access to the Colville we used to. It is all different. It is hard to get to the deeper channels. It has changed from the passed from where it is today. They have a difficult time getting into the river. It is a unique moose hunting area and it is wolf and wolverine hunting area. There are lots of rabbits now. It is an important place for subsistence hunting along with the Anaktuvuk River. Today sometimes we don't have access to go in there but there are areas we depend on for moose and Chandler and Anaktuvuk are important rivers. (Nuiqsut) (SRB&A Unpublished-b)

I haven't experienced it, but I am sure that the lake will dry out in that area. With the permafrost. It will make a river to it and dry out that lake. I haven't seen that. The water moves a lot over the ground. It will make its way through. The water won't stop until it has settled. It will flow down until it finds a spot to stop. Once you are on the river you watch it for years and years. There is a lot of difference. My experience going out every year, I look at the land, I like looking and it is changing a little bit. It hurts a little. It will make me go different directions and think about the animals. It bothers me not knowing how to go up again, if I have to buy different equipment or a new motor. It will take a piece of the land and I can't stop it. Every year it changes, every year. The water has to go somewhere. (Nuiqsut) (SRB&A Unpublished-b)

With the lakes drying out I don't remember where but we caught a caribou and walked past a pond that was super dried out. It was like a big crack 40 feet away and I think that's why it leaked out. (Nuiqsut) (SRB&A Unpublished-b)

I stick by the coast in that area [by Oliktok], but when I go to Alpine I see that the lake they use is getting lower. They use it for everything. It's their main source of water. They use it all the time. They must use them a lot. We have used our lake over here and it hasn't gone down or anything. It has always stayed the same. (Nuiqsut) (SRB&A Unpublished-b)

Some of the lakes are drying up further up river, there used to be lakes further up river and now it is drying up and there is no lakes at all. The changing has to be with the weather pattern and whether or not more ice is being exposed on the river. Where those ice areas are the tundra sinks and erodes. (Nuiqsut) (SRB&A Unpublished-b)

They say that during winter the water on the lakes and ponds are refreshed by ponds but they are really extracting a lot of water for their use in these camps. I think [community member] has a strong point, how much water these development projects are going to use water. They are important spawning areas out there too. How can they minimize that impact? They are using the river to ice chips to build ice roads and they pump a lot of water from the river to these ice roads every year those are being extracted. The only way to reduce that is to have a permanent road to connect these places. Not just to Nuiqsut but also to the different oil pads. Eventually there will be an ice road to Pt. Thompson. (Nuiqsut) (SRB&A Unpublished-b)

I remember my surrounding and growing up around Colville Delta the Colville Delta had not changed, it was normal. The river break-ups were stronger in the 40s and 50s and the industry had hardly been around to destroy or damage the environment. And speaking of wetlands, the wetlands were abundant during the breakup and summer. There were more wetlands back then than today. Today they are getting dryer due to the lack of rain. There used to be an abundance of rain that would feed the wetlands and ponds. The thunder [storms] would bring rain but today we do not have those thunder [storms] that bring the rains. As for the lakes, I cannot speak because I do not know how they are today. Along the coastal line, particularly at Oliktok Point, that area used to be a nice big tundra before it was touched by exploration and today Oliktok is no longer tundra because it was expanded with gravel by the industry. There used to be a small creek but that isn't there anymore because industry has been expanding the point to put drill rigs and buildings… during the summer we used to go to Thetis Island to hunt seals and reindeer seals. There used to be an abundance of seals but today that has changed because the industry is there and they have changed the patterns of the current. It has changed because the oil companies are here and they are destroying the original land and expanding the gravel. Lots of the tundra that was once there are now lost. As far as what the Colville has done in the past, today it has changed. When I was growing up, in the 40s and 50s the Colville was once a big Colville Delta, there were no erosions then. When we came back in 1973 to reestablish the village… We could show you on a map. There used to be a point 5 or 6 miles upriver there was a point but that is gone now. Down towards the end there is a fishing cabin and, on the west side of the bend that area is eroding a lot to. (Nuiqsut) (SRB&A Unpublished-b)

Number 1 is: All drilling operations, will take a lot of water. That means the same thing will happen like they did in Sagavanirktok River. They ran it dry, completely dry twice in one year. And, if that happens in the Colville River or any of these places that are printed up here -- like the lakes, the big lakes and river -- if any one of those go dry, the animals are goi- -- the fish are not going to be there. That's destroying the villages. Raymond Neakok. (Utqiaġvik) (BLM 1982)

I noticed in the first exploration that some of these lakes, especially Shinmar-Rock have dropped about two to three feet loss of water, a depth which is known to be about eight feet. At the time I noticed it-it went down to about five to six feet -and therefore it cannot support any more fish because a tremendous amount of water has been lost in that first exploration at Shinmar-Rock. We enjoy these fish because we know where they're at - and during the winter whenever we need them we can go and get them but these lakes

that I mentioned I would say they are zero fish in them -and even if I was to go in an emergency to survive on these fish I wouldn't be successful. (Utqiaġvik) (FEA 1976)

Water Quality

What about pumping millions of gallons of water out of streams that cisco depend on for oxygen and habitat? If [there is] no oxygen or a place to spawn, that is different from what they know; they will not go there anymore. When you extract thousands of gallons of water, it changes the temperature of those streams or lakes. (Nuiqsut) (ABR Inc. et al. 2007)

When we get this west wind we get a lot of water, the water gets real dirty. That's the time we try to go way upriver, when we get this west wind. All three rivers fill up. East wind is when it drains out. Same thing. North wind drains it out. Northwest current still comes in, southwest it still comes in, [and] southeast it still goes out. (Point Lay) (SRB&A 2011a)

The lakes have changed, I'm sure there are other areas where activities will certainly affect them. [I am] not too familiar with that [project] area, but things around here like the gravel pit over here. I'm sure they will put some padding, using gravel. Where they get the gravel will affect the area, close to the river. The river will get mudded, where the fish are in that area. The rivers here aren't being affected, but there are, knowing how human activities are affecting the creeks, the small rivers coming down from the lakes. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Last summer the water near Alpine in the Colville River delta was 70 degrees. What is happening? What will happen if development continues at these rates? (Nuiqsut) (BLM 2003b)

Even [Eleanor Lake] that is here is not usable here, where we used to get ice and get water. We can't use it anymore because there has been too much human activities; you know, skidoos and snowmachines spill oil, and it makes it not useful. (Anaktuvuk Pass) (SRB&A Unpublished-a)

There are whale bones and old ruins at Pingkok Island. The lands and its wildlife, fish, have changed today. For example, Putu used to have a free flowing channel. Now, last year, it had to be physically channeled. Two years ago, my brother Paul went to fish at Itkillikpaat where he ordinarily fished. He came back with no fish. We used to catch fish anytime we put a hook in. The Itkillik River is now rusty colored. There are even a bridge at Puviksuk. This river used to be glassy clear, as I have known it. These are the effects of past activity. Bessie Ericklok. (Nuiqsut) (MMS 1979b)

3.2.12 Solid and Hazardous Waste

Mayor Rossman Peetook indicated that that he would like to talk about the area that is being used for NPR-A, Alaska EIS. That area is being used for subsistence area uses and will probably be polluted if the industry takes over the land. He's very concerned about that because he wanted to use the example that the DEW line sites have been left vacant. There's pollution there that's never been cleaned up, and he feels that that same thing will probably be there if the industry or the seismic people use that area oil and gas. He is not against oil and gas leasing. But that he feels that until such time that better technology is available to be used in order to safeguard the area for fish for the caribou, for water fowl, these are very important to the lifestyle of our people. He knows

also that Teshekpuk Lake, there's all kinds of various fish there available. And what it would what would happen if something drastic happened there, and then the livelihood of the people that are dependent for subsistence what will happen to them. (Wainwright) (SRB&A 2003)

Down by Icy Cape there's been a lot of reports of sick animals in that area. There's a few people who have gone down there. When they walk up on the land they noticed that there's drums buried in the ground from the old DEW line site. They didn't dispose of their fuels the right way. That's why everybody thinks the animals are getting sick. (Point Lay) (SRB&A 2013a)

Cause of the fast motion of the Colville, that's getting close to where the contaminated buried sites, cause each year, the erosion on the Colville seems to be faster every year. I travel a lot on the Colville during the summer months, especially when the moose season's opened up and we noticed that the erosion, every year it's faster. (Nuiqsut) (BLM 1997b)

Contaminants and drums were found in the rivers near the runway. A lot went in our rivers; that could be one factor to review. (Nuiqsut) (ABR Inc. et al. 2007)

We've got that Umiat, the erosion of the Umiat dump is floating through the river. That's a possibility, that the caribou might have been hanging out at that area. That's where the caribou's actually coming from. We've been finding containers, material containers along the river, you know? From the Umiat dump. The river actually eroded the ground and the dump is falling into the river. We left it [on the tundra]. (Nuiqsut) (SRB&A 2014a)

3.3 BIOLOGICAL RESOURCES

3.3.1 Vegetation

See traditional knowledge provided in the CLIMATE AND METEOROLOGY section for traditional knowledge that is also applicable to this section.

This is an effect. I've seen it. I have to go further and further out to get our food. Our ice pack is getting smaller. Our ice is not freezing. Used to be nine to 10 feet thick, now it's four feet thick. Our climate is changing. It affects our plants, like our salmonberries. If rain is low, it will affect us. We mainly need salmonberries for vitamins. We are mainly meat eaters so we need the berries to prevent scurvy. (Wainwright) (SRB&A 2009)

Berries used to grow in abundance one year and don't grow the next year and now its seasonal, every summer. Salmon berries, blueberries, black berries are growing every summer. Before, there was a break. Seems like the berries are more prevalent, and they grow every summer now. And there used to be a break from year to year. Now there's no break. So the wet summer helps the plants. (Anaktuvuk Pass) (SRB&A Unpublished-a)

And on the tundra travel, there's always never any snow on the foothills, because I've been hunting up there. There's always -- the snow is always blown off on the top, on top of the foothills because of the wind. And I thought there would have to be a foot of snow or something for the Cat trench to start. And there's always not enough snow so you tear up the vegetation. No matter what you do, you tear up the vegetation because the wind blows up -- blows so much in the North Slope. There is always not enough

vegetation -- I mean snow to cover all the vegetation. And that's why I would keep that -- keep the traveling at a minimum instead of extending the days of travel for the seismic crews and the oil companies. I think that would be something to think about too. Because I've seen them plow theirselves right through bushes, those little willows along the creeks. If you break a willow, it takes over 30 years or something for it to grow back. So you've got to keep that in mind. (Utqiaġvik) (BLM 2004f)

You look at Pik Dunes up there, you somehow char up the tundra a little bit, and because of the rate of revegetation is so slow, that sand, if you rip open the sand, the desert storm ripple effect can happen. So it's a very sensitive tundra we have. (Utqiaġvik) (BLM 2004a)

The changes in transportation has caused a lot of trails and changes to the water accumulation in these areas. There's a lot more ponding in areas that have been used for ice roads and other activities. The ponding creates crevices in the land and it damages the vegetation. There's areas that were available for nesting and such that get under water after the usage occurs. There's increased concentration to activities from our community because there's diversion from other areas that are already being developed and are being explored and developed. So those increased concentrations from our village are now into the areas of this Northeast NPR-A. (Nuiqsut) (BLM 2004d)

Less berries. We used to go right out here and have berries and stuff. We don't hardly ever see berries anymore. When we go to the traditional spots that my grandma went there are still berries out there. It's cause I used to do that all the time when I was young. Me and my friend would be ptarmigan hunting with slingshots and eat berries at the same time. After a while we just stopped seeing them all the time. I don't really know why, they just stopped I guess. (Nuiqsut) (SRB&A Unpublished-b)

The ice roads, when they melt you can see where the road has been. I don't' know what they use, they use lake water and make ice chips and spread them where the road is going to be. Then they put regular water on it. I think it's cause it [the road] stays there a lot longer. They just don't grow; it's completely brown where the road goes. (Nuiqsut) (SRB&A Unpublished-b)

In Nigliq we used to get buckets of berries and now we hardly get any. (Nuiqsut) (SRB&A Unpublished-b)

In the Colville Delta region the vegetation were abundant to the point where you could smell them. Now we cannot smell them anymore. You have to get closer to their patches now to find them. They have been gradually depleting. (Nuiqsut) (SRB&A Unpublished-b)

Since we left the Colville Delta region in the 1950s coming back in 1973 I noticed that the changes had already happened. The plants and the vegetation and the berries that grew a lot were abundant and now there are hardly any. The willows, the leaves were edible because they grow in abundance and they were just like having dinner salad and now you don't have those today we don't eat what we would have eaten off of the bush. (Nuiqsut) (SRB&A Unpublished-b)

Like the rhubarb doesn't grow anymore. I saw some at Fish Creek but I don't see them anymore. I noticed that when we were young we used to pick rhubarb and eat them off of the shorelines and now there is hardly any. (Nuiqsut) (SRB&A Unpublished-b)

They are not really that sensitive; they seem really strong because of the soil. It has a lot of nutrients. You could sell it like miracle grow the soil. It is even better. My cousin was growing a plant that took 6 months to grow, with our soil it grew like huge. The reason is that we have such a short summer. (Nuiqsut) (SRB&A Unpublished-b)

Shrubby Plant Species

Well you know it is obvious that climate change and development is something that, you know that's happened – 10 years ago you are not going to see these willows growing along the road side but now we're seeing those a lot– and now we're seeing land otters that we don't, we don't normally see coming or new animals migrating up North – that's climate change effects – because of how geographically (unclear) may be. (Nuiqsut) (BLM 2016b)

There are some birch trees growing, and cottonwood. Birch wood or cottonwood trees are growing here. That didn't use to happen. (Anaktuvuk Pass) (SRB&A Unpublished-a)

There's birch trees, over here [pointing east]. I don't know why they are growing now. We always have alders, they are always here. (Anaktuvuk Pass) (SRB&A Unpublished-a)

There are spruce trees right here to the south now, just close by. (Anaktuvuk Pass) (SRB&A Unpublished-a)

3.3.2 Wetlands and Floodplains

See traditional knowledge provided in the WATER RESOURCES section for traditional knowledge that is also applicable to this section.

With the satellite programs, I, too, am very concerned about satellite -- the crossing of the Nigliq Channel, the bridge design, as well as CD-4 as well as CD -- I believe it's 7, the most southern site. Nuiqsut has not experienced, neither has Alpine, what we call the 100 year Colville flood. We've only experienced a 25 year flood and with that 25 year flood, it came very close affecting those areas. Now, with the 100 year flood that hasn't occurred -- and I know you have data of what a 100 year flood might look like, but when we first moved here in Nuiqsut, that 100 year flood -- the whole plains down there was covered except for the hill down there. And we haven't seen that ever since we've been here in the 30 some years we've been here. But, you know, the industry needs to know of these dangers Mother Nature brings out on these sites and areas. There are things that -- you can do all the protections you can do, we can have all the policies and stipulations in places, but when Mother Nature's forces come in line, there's nothing any of us can do to stop her of what she's planning to do. And this 100 year flood will come and it will occur and it will devastate those well sites that will go into the Nigliq Channel. (Nuiqsut) (BLM 2003b)

Every year we get flooding in the Niġlik Channel, and every time at the mouth the ice builds up and carries gravel or sand and then slows down and drops gravel. So every year it drops more gravel and it gets further out. The channel, mouth of the river, is

getting shallow. (Nuiqsut, Experience location: Nuiqsut. SRB&A Interview 2007). (SRB&A 2009)

During the break up of Kuukpik River, there used to be floods all the way up to Kayuqtusiluk. During the ice break up of 1945 the water level rose 20-30 feet. I haven't seen that since. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

Back in the 70's we used to have major flooding. The whole place looked like an island. You could see the hill over here like an island with water covering the whole land. That will probably happen again in the future when we start getting more snow. (Nuiqsut) (SRB&A Unpublished-b)

They used to have really big floods, I haven't seen the river go up that high in a long long time. (Nuiqsut) (SRB&A Unpublished-b)

3.3.3 Wildland Fire

For some reason the caribou haven't been coming as far east [toward Colville River]. There haven't been as many caribou lately. It's just variability in the migration. They had that huge fire in here a couple years ago. So much smoke poured out of there it might have kept them from coming. I don't know. Maybe they got out of the habit of coming here. (Utqiaġvik) (SRB&A 2013c)

And it's just sad to see that also the fire that came in July, how it affected the migration. And we -- we talk with the borough, and they wanted that fire to burn out itself, but it didn't. And like Charlie said, it takes about 50 years to grow them lichens. And where the fire is, I think it burned a lot of that. And we'll just have to see next year where the migration will be. (Anaktuvuk Pass) (BLM 2007)

We do get the effects. It covers the whole Umiat area. Forest fire comes from the interior and over the Brooks Range. The whole village area will be affected by the smoke. You can smell that burning all of the way up here. It doesn't go away right away it stays in the area for a while. Even when the tundra fire up… visibility was zero up there. Majority of the caribou migrating south accidently turned around and headed south. The moose was driven down river because of the smoke. (Nuiqsut) (SRB&A Unpublished-b)

[There are] fires down south, over there [tundra fires]. Inside the house it's getting stinky from the smoke. You can't see the mountains for two days. Planes can't even make it. [The wind blows] both ways north and south. [We have] east wind and west wind. It goes through the valleys. The mosquitoes come when [there is] no wind outside, [when it is] hot. (Anaktuvuk Pass) (SRB&A Unpublished-a)

3.3.4 Fish

See traditional knowledge provided in the ACOUSTIC ENVIRONMENT, WATER RESOURCES, and SUBSISTENCE USES AND RESOURCES sections for traditional knowledge that is also applicable to this section.

Salmon, Whitefish, and Other Fish Observations

Whitefish

Mr. Ahvakana: Thank you. Thomas Itta, Sr. was born and raised in the vicinity of Teshekpuk Lake, Cape Halkett is the place were he was born. Ever since he could remember he used that area for subsistence hunting. And all those lakes that are there visible, all of them, have fish in them. And he also stated that all the rivers that are around Teshekpuk Lake all flow into that lake and , therefore, they do have fish also. That Teshekpuk Lake from the beginning that we could remember that's been passed on by--from generation to generation. Our forefathers had stated that there's fish there that nobody knows that exist in that lake. (Atqasuk) (SRB&A 2003)

Get qaaktaq in the Kuugaagruk River [Inaru] around December, although that's getting late, it's getting too cold. The qaaktaq come up the river later than the other fish. They're milling around and then they decide to come up later for some reason. We don't get a whole lot, like they do in Nuiqsut. In October on the Chipp River, you can catch qaaktaq going upriver. You can catch more of them later in the season, like December or January, rather than in October. I don't know why they do that. Maybe they're out on the coast and then they come in? You can get qaaktaq in all of the river drainages, including Chipp, but only a few of them. You get them, but not a whole lot of them. We get the ones that are going up river in October. I haven't seen any with eggs then. Although have seen qaaktaq in Nuiqsut with eggs starting to grow in them. Maybe they spawn in the springtime so in the winter when they're being caught the eggs are just starting to grow. Then they will be bloated with eggs by the spring. (Utqiaġvik) (Brewster and George No Date)

Food for qaaktaq is less. They used to have shrimp in their stomach in the past; now it is like they are eating mud. (Nuiqsut) (ABR Inc. et al. 2007)

Before industry came, they [qaaktaq] were always healthy: size was larger, the amount of fat was higher. After the causeway, they are smaller, unhealthy, their food is unhealthy; they are eating something different. In the past, they had shrimp in the stomachs, when they were caught before the causeways were built. (Nuiqsut) (ABR Inc. et al. 2007)

I get qaaktaq at the mouth of the Chipp River before I go home, before freeze-up. I use a three inch mesh net. I also get them at the mouth of the Alaqtaq River, where it enters Pittalugruaq Lake [Pittallukruak Lake]. Also, I've seen qaaktaq all the way up to Chipp 9. I've caught them in my net. I've caught them up that far. We eat them fast. They're choice fish. (Utqiaġvik) (Brewster and George No Date)

Qaaktaqs are known by their white fins. They don't have a black tip. The large cisco are blue. And it looks like you couldn't see the scales. And they're about that thick. There used to be a lot of them when I was going up to my camp. Back in them years when I'd go with a canoe I would sometimes get started too late. And I just go around the Point [Point Barrow] on the other side, towards the [Elson] Lagoon side. And then drop my net from the boat, along the edge of the boat. By Nuvualuaq [Plover Point]. But you have to watch closely because there are a lot of seals and loons and other animals going through that deep channel, including walrus. (Utqiaġvik) (Brewster and George No Date)

The boundaries of paikjuk doesn't go beyond that area that's west of Alaqtaq. I've never seen it beyond that. That's kind of why I protected that area from seismic. I didn't want to lose sight of that only fish that I know called paikjuk. It's a beautiful colored fish. They are located only in that area. By Warren Matumeak's. Alaqtaq. From here, going over toward the Tasiqpatchiaq. I went through there one time before there was this break into Chipp River. And this old man that fished here talks about them and he goes up into the Chipp River up to where Charlie Edwardsen was fishing then, too. And Paul Kignak's camp. East. I've never seen them west of the river. But the west of the river, those fish become to look like lake trout family. Some big ones. And the aanaakjiq up where those lake trout were, were different color than the ones we were getting at the river. I don't know if they can spawn together maybe. I don't know if lake trout can participate in that. That large lake near Chipp 2 contains the smaller ones. And you can kill them in three inch mesh net. They're beautiful fish. I like them. And they're right up over in that area. Along with Alaqtaq. And that was the reason I was opposing making a landing field for delivery of diesel on those lakes. If they destroy those fish and they don't live in any other area where we know them and we can't ever find them in any other place, then I don't want them destroyed. Also the natural habitat is being destroyed by natural erosion of the river and other areas where you can't protect anything when that happens. If the river breaks through, it breaks through those lakes containing some species of fish. Some with lake trout. (Utqiaġvik) (Brewster and George No Date)

I know these lakes, rivers and lakes, but I think this is the one that I heard so many times to be a subsistence spawning area. This little lake right here, [Chipp-Ikpikpuk Report, AB-19] it's a spawning ground for those fish, and they know it and when they spawn they go and pick up a lot of fish, you know? And they just go in there and get grayling and whitefish and all that spawning and they just mingle in there and get them. (Utqiaġvik) (Brewster and George No Date)

There are lots of fish in Qaababvik. At the mouth of it. We used to go there while traveling and needed a safe place to wait for good weather before crossing Dease Inlet. And we'd fish there. We'd get aanaakjiq [broad whitefish] and lots of iqalusaaq [least cisco]. (Utqiaġvik) (Brewster and George No Date)

The Chipp River is known for aanaakjiq, and also for burbot [tittaaliq] and iqalusaaq [least cisco] and those little humped whitefish - pikuktuuq. There are many in those areas where they seek burbot and grayling. They follow the spawning of aanaakjiq every year. Boy, you catch those with a hook, the pikuktuuq and the tittaaliq. They just follow the spawning run of the aanaakjiq. The Alaqtaq River is good for whitefish. It's good fishing in summer until July. By last part of July they're starting to disappear. We know they're moving someplace. So, all those lakes in there between Alaqtaq and Chipp River are mingled with those fish, with aanaakjiq. And they don't have to be deep, as long as they are about seven feet deep. (Utqiaġvik) (Brewster and George No Date)

The biggest fish I've seen are from Tasiqpak. The ones that are fat are right from this area. I think that some of these spots are fifty feet deep, and they contain big fish -- aanaakjiq. All of our nets were too small, when they got tangled up. But this guy had a very unusual net, made with three mesh deep. It was a big one. And he would make his own nets. And he'd get two fish, it was more than enough of a load for him to take home. The fish were big. And me and Tommy Jr. went up going through west Tasiqpak [showing on map] -- this way I guess. In this one lake. It was deep water. It was about fifty feet. And the aanaakjiq were big. And when we started to pull the net in it was moving like mad, but when we got it out, we got only two or three fish. Big ones. And five fish was pretty

near a sled load. There are big fish down there. The biggest aanaakjiq I know about came from the Mayuabiaq River. This was Elavgak's grandpa. Daniel Leavitt's mother's grandpa. He had one net. One fish was enough for him. He would drag it home like a seal. Put a rope through the mouth and pull it over his shoulder; you know just like dragging a seal home. It was that big. One fish filled the net. (Utqiaġvik) (Brewster and George No Date)

Char and Other Freshwater Fish

Most of the lake trout I've seen outside of Tasiqpak are in deep lakes. They don't stay in the shallow lakes. Where lake trouts are found is usually an impossible area for the fish to get in. They don't escape to travel like aanaakjiq do. (Utqiaġvik) (Brewster and George No Date)

In Barrow, in August, the fish along the coast are coming from the east. One time I saw the water churning off the beach and it looked like Iqalukpik [dolly varden char]. They're good eating fish, so after I saw them I put a net in and got some. I put the net out in front of NARL [along Chukchi Sea coast]. People don't know this. They put their nets on the Elson Lagoon side for aanaakjiq, but the dolly varden are traveling out on the other side. I've seen them at Point Barrow, too. In Point Hope, they put a net out from the shore at a 45 degree angle and wait for the fish because they are traveling along the edge of the shore. So that's what I was doing. (Utqiaġvik) (Brewster and George No Date)

There are some underground rivers around the middle of Teshekpuk Lake. There's the shallow part and they have rivers through there. They call them rivers. That's where the fish travel. The big fish, the thirty-five pound lake trout, are in those deep channels. (Utqiaġvik) (Brewster and George No Date)

This certain place where they used to set up their nets is by where we put cabins in on the Tupaabruk River [Tupaabruk 2 area, see Figure 96]. There are three houses there, plus Mary Lou Leavitt set up a house across from our houses. We put the cabin there because it is a good fishing spot. We put the nets out around the bend and they catch all kinds of fish. Besides at night when we want some burbot, we can just go fishing. It's close by. (Utqiaġvik) (Brewster and George No Date)

Tittaliq [burbot], that's the Meade River, at Atqasuk. The real Atqasuk. That's what they call it, Atqasukiak. The real place, before they moved it to the village. Winter ice fishing. And we get the qaaktaq at the same time, and the humpback, the pikuktuuq. Right at this creek, right there [Usuktuk River]. A lot of burbot, big burbot. The biggest one I got was this long and this wide. (SRB&A Barrow Interview March 2006) (SRB&A 2010a)

And when I go up inland, go fishing, you start getting catfish. Those are unusual in our rivers up inland. You start getting these catfish. And those catfish are always on the ocean, not on rivers. Johnny Aiken. (Utqiaġvik) (MMS 1982)

Now, the Elders up here warned us about what happens to our food chain when they get -- it gets destroyed, and we look at -- you know, that sound down there, and the herring hasn't come back yet. And what is the herring? The basic food for most of the animals that are there. You destroy that kind of fish up here, my seals are gone, my walrus is gone. And if you destroy the lower part of the food chains, well, America, you will have finally achieved your goal, to destroy the Arctic whale. You tried it in the early 1800s by

overharvesting it. Now you are going to pollute it. George Edwardsen. (Utqiaġvik) (MMS 2009a)

Salmon

I think all the estuaries are major spawning. I get a lot of salmon fish in the lagoon. I get coho, chum, pink, humpies, some [Arctic] char once in a while, and in August King salmon. I've had a net out right at Kokolik mouth, and I was getting Least Cisco in there one year, and I used a small net in the fall time, August and September. (Point Lay) (SRB&A 2011a)

Salmon, they never used to come up here. In summertime, by our cabin, I got a net. And it started getting some salmon. Dog [chum] salmon. Real big toothed ones. Not very many of them. We never used to get them, but now we do, so maybe they start moving from someplace. (Utqiaġvik) (Carothers et al. 2013)

Kukpowruk and Kokolik are our important spawning grounds [for] the salmon, the grayling. When I first came there was a lot of fish bones on the ground. Past Niklavik, [it is] just graylings. (Point Lay) (SRB&A 2014b)

I think our prevailing wind has changed to the south, southwest. It's been dominating the winds have been dominating from the south and southwest. It's warmer air and high tide in the lagoon and it's not favorable for salmon fishing. The current has to be going out when the salmon come in. (Point Lay) (SRB&A 2013a)

Fish Movement Patterns

Lakes and Rivers

And when I thought about that and I -- if you looked at a picture of the whole North Slope from the Canadian border to Point Hope, you look at where NPR-A is and the central part of the North Slope, there is thousands of lakes and lots of little creeks and rivers. That's where the majority of those lakes are. And what that tells us is that that habitat is so critical to fish. You know, you could see there, all those lakes that have fish in there, that's just a snapshot of fish that, you know, they identify as fish bearing lakes. But listening to elders in my family, even biologists who study fish on the North Slope, that these fish, they move from lake to lake through streams, through creeks that are seasonal. They might not be there year-round. And if you build roads in these areas that don't have a river, like a permanent river, but you're going to block their connection between these lakes, from moving from river to lake to ocean or whatever it may be. And I don't think there's been enough research to document that. So you need to seriously think about how that's going to impact the habitat of the fish on the -- in that area of the North Slope. (Utqiaġvik) (BLM 2004f)

Wind in Teshekpuk Lake affects the fish. When it's ufalaq [west wind] they never come. There are no fish there. When the wind is from nigiqpaq [the east], that's good. That river [Mayuabiaq] is so different when it's east wind. The water gets better. But when it's west wind the water is low. In our area around there, Mayuabiaq, when it should have lots of water at ufalaq, it's different. The water goes down. I think the wind pushes the water from Tasiqpak. (Utqiaġvik) (Brewster and George No Date)

Also we've mentioned before that we're now moving in to the heart of the broad white fish, the ahnalik center of distribution and population density, and these fish have a

complicated lifestyle that requires use of several types of habitats: lake habitat, deep river, spawning habitat, small ephemeral streams for accessing summer feeding areas - they go out in the near shore area - and all of those different habitats are used in different parts of their life cycle. So it's important when building gravel roads and structures not to impede even very small streams in order to retain healthy populations of this fish. (Utqiaġvik) (BLM 2003a)

I notice that these fish we have, the white fish, have not migrated out into the ocean, they just migrated back into these lakes and stayed there for the winter, they are locked in for the winter when they get there. Some of these lakes that I named as the rearing ponds are also the wintering areas for these fish. (Utqiaġvik) (FEA 1976)

The area around the lake … is all flat tundra. Every spring, at break up … all the flat tundra around the lake is very grassy and when the water level rises, the low-lying areas with dips and hollows become flooded. That's when all the pike go all over those grassy pools. When people are short on food, they would go fishing for them. They are ideal for dog food (Arctic John Etalook, pers. comm. 1981) (Anaktuvuk Pass) (Spearman and Nageak 2005)

They are real resilient fish. They go up these streams [the Miluveach River and others off the Colville River] and right up the waterfall, and they feed off the waterfall. … It depends on the season [what the fish eat]. Like late August, early September, they feed on beetles. … [Also,] we have little stickleback that graylings and the other fish eat. (Nuiqsut) (HDR Alaska 2015)

The big run for iqalusaaq is in the summer. In the wintertime, you can put a net out under the ice and get a lot of them. We'd go to Kuugaagruk [Inaru] River for that. We used to eat a lot of those iqalusaaq and then feed them to our dogs, too. (Utqiaġvik) (Brewster and George No Date)

There's usually two to three weeks of a fish run in the fall. Just when the ice is forming. Aanaakjiq, iqalusaaq and pikuktuuq they come together. And sulukpaugaq. They all run together. Our belief is that after the rivers begin to form ice, the fish are heading back in up towards the inland area into the lakes where they came from. (Utqiaġvik) (Brewster and George No Date)

The Alaqtaq River is good for whitefish. It's good fishing in summer until July. Last part of July, they're starting to disappear. We know they're moving someplace. They're heading up to Chipp River. We know exactly the route they are taking to go up there. They go through Tasiqpatchiaq. And go through Pittalugruaq one time. But the river has broken through to Chipp River and is flowing this way now. It still flows out, but the channel has built up [increased water flow] and it's deep water now. And there are those streams that flow into the Chipp River and other main rivers. There're some streams like Tittaaliq, Aumalik, Qaksrabavik and Qubafnaq and stuff, but those are up in the headwaters where the water is coming from. There has to be enough water up there that they continually flow in the summer without letting up. So the fish are going up there, too. Those little fingerlings are the ones that go through those, too. And there are some lakes up there we know where the grayling are found, where the fish will go. And then four or five years later the big ones that are ready for spawning. Male and female. They go down. And you are tagging them coming up. They go from Alaqtaq area and then go in there. Those that are spawning grade are going up. And in the fall, just before around freeze-up, they stampede back down to spawn in those qaglus. Same thing, going up or coming

down to spawning, I imagine those fish know where to go for spawning. Now, some of the things you didn't catch out. All the fingerlings don't go all the way here. Some get lost. The majority of them, they go into these bays. When the break-up pushes them all out, they have to go somewhere. They run around, probably escape predators. The only way they will reproduce is in these lakes. (Utqiaġvik) (Brewster and George No Date)

Fish in the lakes, the small ones, are in the rearing ponds. As they grow into big fish, big enough to spawn, early in the spring they stampede out while it's high water. That's when we get some good fish. I like to be there to catch some of those. They already have roe. They are not prime, not ready to spawn out, but they are there. The eggs are glued together. You can't separate them easily, like you would at spawning time. During spawning time, you just squeeze the fish and the eggs pop out. Sometimes we have to clip the tail end to leave the eggs in there and then freeze them that way. All the fish [ones in rivers and ones that had been in lakes and moved to river through streams at high water] go to the headwaters of the Chipp River in the summer. They head up to the headwaters. How far up? I've never made it up to the very end of the Chipp River, but I have gone a ways up. Even tittaaliq and grayling go that way. In the fall, the fish are coming down the Chipp River for spawning to the deep water. There are deep water holes in the river where the fish spawn [qaglu]. Those fish know what they're doing. I think they know that during spawning they want to come down with a spawning group. If the run is good, the majority will go down towards the bay, and to qaglus where they spawn. (Utqiaġvik) (Brewster and George No Date)

Nalaakruk Lake has really good, tender fish. It was different. I think the oil companies used that water and it's really different now. The water looks different, they say. Our son [Billy] usually goes there for a few days in the fall and gets real good fish. They are different than the river fish. Aanaakjiq. (Utqiaġvik) (Brewster and George No Date)

In the 1930s, '40s and '50s, we usually ended up fishing on October 6. We started around September 23rd with a dog team traveling through snow and ice crossing small lakes that were already frozen enough and useful for traveling. We knew the fish run would start around September 25th or 26th. The fish don't miss that. We have to be there to catch them, otherwise after five or six days the run is over. And if you don't catch them then, you don't have much subsistence food to put away. Today, it runs all the way into October, 10th or 15th. (Utqiaġvik) (Brewster and George No Date)

Six days before spawning, seven days at the most, that's when I want to arrive at my fishing spot on the Chipp River. That's why I have to be there. You have to catch the fish run when it's happening. After the 10th of October, it makes no sense. The run is over. Right now, it's changed to the 10th. The run used to be from September 26th on down to October 1st. It's ten days difference now. I figure the change of climate or some measure of change has to do with it, because we have a late freeze-up today. In my younger years, I would go ice skating maybe on the 15th of September. And then the reindeer corralling time would be the last week of September. And the ice would be that thick and it was just right for making a huge ice corral. We put all the reindeer into that. So that's the difference today. I mean somewhere around October 8th or 10th, up to there. In those two areas, I would pull all my nets out. No matter which way you look at it, spawning has to take place. I don't know if the fish can hold off that long. (Utqiaġvik) (Brewster and George No Date)

Nearshore Marine

When the weather is warm, [there is an] overflow from ocean, in July. It changes the fish coming in. [I saw that] in [the] last few years. When the overflow from saltwater is coming in (from a west and southwest wind), it coincides with warm spell of the weather. (Nuiqsut) (ABR Inc. et al. 2007)

The Arctic cisco and broad whitefish always come in [on the eastern side of the mouth of the Colville River]. A lot of animals like bearded seal, [ringed] seal, and spotted seal begin coming into the river from the ocean during the time that it is continuously dark. Also at the mouth of the Nigliq [Channel] is where bearded seals increase in numbers in the darkest months of the year [early winter]. … We get seals, bearded seals, sea lions do come in there near the mouth of these channels to feed on fish. And they do hunt in those areas: Colville Delta region all the way to Nigliq and some are in Fish Creek area. They're abundant in August- September. That's when the fish start coming in.…Some do come in way inside somehow.…I got ugruk [bearded seal] by Kayuqtusiḷuk…It was around with a lot of spotted seals. (Nuiqsut) (HDR Alaska 2015)

It is noted of 28 species of fish that comes over winter and have them -- and half of those fishes winter in the Colville River. Like the Arctic cisco is a migration fish that spawn from the MacKenzie that has been pushed through the current until they are three-, four-year-old. By that time they are in our river system. But there is fishes that comes in the river. That's why we are worried what will happen. (Nuiqsut) (BOEM 2011)

I have fished most of my life and have noticed that the fish follow the currents. During the summer months we would never have to leave the shore to catch fish. I also remember that most of the Arctic cisco caught during the summer had eggs within them. Starting in July when it starts getting darker, they follow the salinity of the ocean. They never leave the shoreline in summer. The families used to fish where Helmerick put his cabin. Once the causeway was built, the seawater treatment plant, changes began to occur. These changes affected the size and abundance of fish. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

In older days, with a west wind [we] hardly caught any fish, but today we catch most fish [in a west wind]. In the past, the west wind used to push fish out, whereas today, we depend on the west wind to push the fish in. (Nuiqsut) (ABR Inc. et al. 2007)

In the beginning of August, the Arctic cisco turn around and start moving back into the river. Large fish seem to disperse a long way east and west from the Mackenzie River. Other white fish from the Mackenzie peter out at Herschel Island. Other fish from the Colville peter out at Flaxman Island. But Arctic cisco are found all the way along between the Colville and Mackenzie. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

The reason why I had my sons pull out all the fish nets in December was it was an unusually different weather pattern this year [December 2003 - February 2004]. It was hardly below zero until December. [On the rivers] the salt water will flake up, and there's flakey ice that looks like maybe the fresh water is coming out from the river or somewhere. It forms paper-thin, and is real sharp and then it moves. But in the salt water it is in a different form and it will collect easy on your net. And it will float the net no matter how much weight you put on it. It collects so fast through the current that I told them that happened to me more than once. So you might as well pull the nets out, because I think you're going to have a bad situation trying to pull them out later.

Because I know, I've done it before. I got caught in it. Got caught twice, it's enough. And then I remember it. (Utqiaġvik) (Brewster and George No Date)

Health and Physical Abnormalities

The fish we get, the cisco—it seems more contaminated—like chemicals are eating away at it, not that another fish had taken a bite out of it. There are big sores on fish, and some are deformed. You see this especially on the belly and tail. They have pale-colored meat, the color is reddish. You have to throw it away; you can't even feed it to the dogs. (Nuiqsut) (McBeath and Shepro 2007)

When I started seeing dark spots in the liver [of burbot], I, I mean I ask questions. 'Cause I know for a fact there's an old dump site just a few miles upriver and lot of it is toxic. So might have something to do with those dark spots showing up on those livers 'cause the liver of a burbot is our delicacy. I mean it's probably the best part of the fish that we go after. But then after start seeing that dark spots in the liver they might start shying away. Start telling my boys no more from that place. (Nuiqsut) (Brown et al. 2016)

They are smaller, skinnier fish now. I have a picture taken in 1973, when things were different. Fish are very small now in the channel compared to thirty years ago. Then people caught from two hundred to six hundred fish per net per day. Now we get one to thirty fish per net per day in the same area, on a good day. (Nuiqsut) (McBeath and Shepro 2007)

She said that she was raised here and she's been living here, and over the years she has personally consumed qaaqtaq, Arctic cisco. And the liver is a delicacy for her, but over the past couple of years there has been discoloration of the liver in Arctic cisco. Although the fat contents are still evident, there appears she hasn't had any liver from the qaaqtaq for the past two years because of the discoloration of the liver from its normal color to a darker, blackish color in some cases. Flora Ipalook, translated by Delbert Rexford. (Nuiqsut) (MMS 2007c)

In the 1970s [the] fish were healthy and you could cook all of those fish and [the] taste was good most the time; now, the fish has changed, the taste has changed; even the fresh fish they catch today tastes like it has been in the freezer for a long time, freezer burn. (Nuiqsut) (ABR Inc. et al. 2007)

Effects of Seismic on Fish

In the wintering years when ice gets thicker and the waters and the fishes are even more sensitive because the ice, the more ice there is the water becomes more dense, so much that it's -- any little sharp noise or bang of those effects can kill fish. And included one incident where when there was fishes site on a clear day you can see it clear, but under the water and - and for -- not for it to be lost, the ice is 10 to 14 inches and you can slap that with a -- like a bang and cause that fish either to die instantly and those are known types of things that have killed the fishes and especially when the ice is thick, because the pressure of the ice makes that water more dense and easy to kill the fishes. (Atqasuk) (BLM 2004b)

He said they were sounding along the river bank by Kuugagruk, and put up poles all the way by the river banks. And, they were sounding there ever since the fish were scarce. All the other rivers drain to the ocean, and when there's Spring breakup, then

all the debris and everything that's in the river goes out. But, Kuugagruk happened to be different than those other rivers, because it does not flow out to the ocean. And sometimes, the debris will collect in that river because the oil companies had been doing some testing there. After they did that, there was lot of dead fish along the along the river banks, like they were just a long line of wood that they gather from the bank of the river, sometimes. They said the river banks were just full of dead fish after those testing on that river. Noah Itta translated by Alice Solomon. (Utqiaġvik) (MMS 1982)

And, as told in a comment made by an inland person earlier, he said his father would kill fish by hitting (the ice) from the top, and if there is ice-free water under there the fish would die. And then he would make some holes in the ice down-current for the dead fish to float up through. This, (his story) is also true. This is how the (people) that are drilling, using explosives on land during the winter near the lakes, kill the fish. And also in the ocean when they are using compressors, it is no different. A person saw this with his own eyes and knows that just by hitting the top of the ice the fish would be dead. A compressor which sends off a very loud noise (and vibrations) can also kill a lot of fish. (Utqiaġvik) (SRB&A 2003)

Due to the ships traveling about we didn't get any whitefish this year. Usually we get plenty. This year, with all the ships dragging seismic equipment, we didn't get any fish on our river. (Wainwright active harvester; Experience timeline: 2006; Experience location: Kuk River. SRB&A Interview 2007) (SRB&A 2009)

And he's more concerned about the east -- the lakes east of the Ikpikpuk because they are filled with fish, and he's very concerned about these for wintering and seismic because these are the Community of the Arctic Slope, Barrow, Atqasuk, Nuiqsut and Wainwright, they still rely heavily on the nutritional supplements from subsistence, and renewable resources especially in these fishes -- I mean, lakes where there are fishes. These are known, you know, for to supplement the dietary and nutritional needs. And they need to be heavily protected. There is not much more else that we can rely on other than our renewable resources that is just so sparse right now, but being on the whim of extinction, on especially in the advent of seismic and oil and gas exploration. (Atqasuk) (BLM 2004b)

During the course of early seismic testing during that oil exploration, the blasting of the dynamite gave a good recording. But they were destroying all of the fish. The only way we found out that we were destroying fish was in the springtime during break-up when it produced dead fish on the surface. Seagulls enjoyed them all, I think. But the seismic was responsible in them years by using dynamite. Today, they've got different methods. We made a report on that. I was fishing and working for the Navy. By testing dynamite in the river, I learned that I killed a whole bunch of fish. I was part of them, working for the Navy - and I didn't even know it until one guy mentioned that Tasibruaq Lake fish were gone, and there's so many fish on the edge of the lake. They blew one, two, three charges of that dynamite there in that lake. It had some effect too, probably even poisoned rainbows, killed them by concussion, I don't know. (Utqiaġvik) (Brewster and George No Date)

Noise bothers the fish. Seismic crews in the early days used dynamite on fish bearing lakes and rivers. Norman Leavitt said he saw lots of dead fish on the Kuugaagruk River [Inaru]. That's sad. The state allowed that to happen. We had no say. Now they've developed a vibrosis method for seismic surveying, shaking, that doesn't hurt anything because it's gradual not sudden. (Utqiaġvik) (Brewster and George No Date)

My next-door neighbor he mentioned at the time he was up in the fishing area near Alaktak that the dead fish were on the edge of the lake that the seismic had got to during the winter. They did tremendous damage, not only at the lakes that I pointed out but also some other lakes around the area - all these lakes that are ten feet, eight feet or more. There's - or was a tremendous amount of fish in these lakes - one lake has more than three species of fish. (Utqiaġvik) (FEA 1976)

A compressor which sends off a very loud noise (and vibrations) can also kill a lot of fish. An elder (made a comment) to stop (the drilling for five (5) years.) since we, ourselves are elders now. I will support his comment to stop (for five years) to see if the animals will return to(their habitats); I am glad to know that a person thinks in this way. If they are going to drill near the river, don't use the water in that river. The (abundance) of fish will change. (Utqiaġvik) (SRB&A 2003)

This year my husband went fishing. He only took home two whitefish. Not like years past. Ever since the seismic, anything that has to do with noise. They've done some sort of search up by our cabin on the Utukok River. We did not get very many fish. If they stop the seismic, maybe they will come back! (Wainwright active harvester; Experience timeline: 2006; Experience location: Utukok River. SRB&A Interview 2007) (SRB&A 2009)

We never see those fish anymore through here. I think I know why. One of these seismic people, they were sounding in this area, all the way up here. When they dynamited that down there, they blocked that road for the fish when they come up that way. We never get anymore. Last year, was the same way. It's been six or seven years now since we ever catch any. In the summer, sure, we get a little bit, but not too much. Sometimes ten, twelve fish in one net. But, we used to get a lot of them. We have to come out in here, where Noah Itta's place is. We can get our fish in the summer right there only. That's the only place in the river in this area that we can get fish. That's aanaakjiq. (Utqiaġvik) (Brewster and George No Date)

And he's concerned on fish in lakes and rivers over wintering areas and seismic. Sometime ago they had been involved with the -- working with seismics before and it has devastated known wintering areas near here and Ikpikpuk. And these were -- these are dynamite things and they know that this does kill and devastates fishes, stocks of fish, many of them and many known over wintering areas. And he's -- and perhaps on account of those that the setbacks, maybe that may be warranted to be even a little bit more to -- rather than relaxing them in all the ravines, including rivers. (Atqasuk) (BLM 2004b)

This year my husband went fishing. He only took home two whitefish. Not like years past. Ever since the seismic, anything that has to do with noise. They've done some sort of search up by our cabin on the Utukok River. We did not get very many fish. If they stop the seismic, maybe they will come back. (Wainwright) (SRB&A 2009)

Effects of Development on Fish

I believe that sediment studies along the DEW line should be looked at. Nowadays, the fish are skinny and not fat like they used to be. You should look at those problems from the past. Perhaps the fish have an altered migration path in order to avoid contaminated areas. Maybe they migrate out in the ocean farther. But there is something that is causing a change in their migration route. They are traveling longer distances and that

is evidenced by the fact that they are not as fat as usual. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

It is a lot of work to go out there and chisel ice and coming back the next day to check the nets and there is only one fish. It was really sad last year. I barely made a half a sack of fish. When we caught fish, we send some to Barrow. Last year we sent three fish to Barrow and two elders fought over them. This year they are happy with what we are catching. We are able to send more. I hope it gets better. I feel the decline in fish occurred when development began. It has really declined after three years of construction of the HDD (horizontal drilling under the river) near Putu. This year they drilled at Iqalliqpik (Fish Creek); we didn't catch many fish when that rig was there. Now that development is slowing down, we hopefully will see the fish counts increase. I believe noise and development are the cause for the decline in fish counts. Prior to development there were no complainants with the fish counts. First there was Alpine and then North Star. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

I am concerned with industry building more and more ice bridges every year. They build these ice bridges over the rivers of the Nigliq Channel as well as the Colville River. These ice bridges are used to enable rigs to travel over the river in order to reach the drilling site. These ice bridges are built in December and January. My theory is that late in the season, with the building of ice bridges, migration routes are being blocked. With ice bridges being built across rivers, it naturally forms ice underneath. By the time the ice road was done in April we found about 70 feet of ice formed beneath the bridges and only about five feet of open water left at the bottom for the fish to pass. That practically covers the whole river and prevents any wildlife or fish to pass the river at these areas where ice bridges have been built. I would like a study to be done to determine if these bridges are being grounded to the ground. I feel that the bridges affect the fish greatly as well as the community. Industry says no, we need the oil here, but further studies need to be done to do it right… This is a concern because the fish travel within a specific temperature of water and a specific depth. When the ice forms and blocks those specific areas they will turn around and go back or elsewhere. They probably will not go underneath and figure it out. A similar situation is seen among the caribou and the pipeline height. When the caribou encounter the pipeline they will turn away and go somewhere else. They will not stop and think that perhaps nearby there is a crossing path that could be used. With the forming of ice bridges I believe that the fish that encounter it will turn around and go back. I don't think they will go under it. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

The effect of outboard motors on the fish is the noise. Any time you create noise, it's going to effect the fish. That's why when you put out a seine net, you use a rowboat. Fish are closer by if you don't use an outboard. They scatter from the motor noise, but they come back. (Utqiaġvik) (Brewster and George No Date)

When there's noise from people walking on top of the ice or people traveling on top, fish like tittaaliq move away from where the people have made a trail. Now they don't stay around there when there's noise. When there's noise, they're more afraid than other fish. (Utqiaġvik) (Brewster and George No Date)

I feel the decline in fish occurred when development began. It has really declined after three years of construction of the HDD (horizontal drilling under the river) near Putu. This year they drilled at Iqalliqpik (Fish Creek); we didn't catch many fish when that rig was there. Now that development is slowing down, we hopefully will see the fish

counts increase. I believe noise and development are the cause for the decline in fish counts. Prior to development there were no complainants with the fish counts. First there was Alpine and then North Star. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

Maybe [the change in quality] is related to the ice road. Maybe it's blocking wintering fish feeding grounds, blocking the freedom of movement for wintering fish; they are blocked from the ice road near Spy Island [a barrier island east of the Colville delta; Most [of the ice road] is grounded. (Nuiqsut) (ABR Inc. et al. 2007)

My theory is that late in the season, with the building of ice bridges, migration routes are being blocked. With ice bridges being built across rivers, it naturally forms ice underneath. By the time the ice road was done in April we found about 70 feet of ice formed beneath the bridges and only about five feet of open water left at the bottom for the fish to pass. That practically covers the whole river and prevents any wildlife or fish to pass the river at these areas where ice bridges have been built. I would like a study to be done to determine if these bridges are being grounded to the ground. I feel that the bridges affect the fish greatly as well as the community. Industry says no, we need the oil here, but further studies need to be done to do it right. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

Titaaliq, the burbot, just about every year I go ice fishing. Last year I caught one and it was yellow where it was supposed to be white. A few other times the liver was discolored and I am wondering if that is coming from Umiat or all that stuff they buried at Pivoqsook and all the erosion from the banks. (Nuiqsut active harvester; Experience timeline: 1992 and ongoing; Experience location: Tuiqauraq. SRB&A Interview 2007). (SRB&A 2009)

Dredging affects the turbidity of the water and in turn affects the Arctic cisco and their migration patterns. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

There are little fish that are good for qaaktaq that discharge out of the Colville River– ice bridges are blocking them in. (Nuiqsut) (ABR Inc. et al. 2007)

Our fish used to be a lot bigger. We have gone from 3-inch mesh net to 2.5 inch. One year they said the low catch in the Nigliq was because of the slush. After the first year of the crossing [HDD drilling under the river], there was a lot of drilling mud that was lost. Scientists and biologists believe that this mud has not affected or harmed the fish because the mud contains a lot of salt. Some people are skeptical; they feel that this didn't help the fish at all. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

We're already a living example of if you would eat contaminated animals or fish. Right now, our burbot is contaminated with PCP form the contaminants in Umiat. And we're - I'd say like 60 percent of the village used to harvest burbot. Now I'd say only 10 percent if even any 10 percent. (Nuiqsut) (MMS 2001b)

There are lots of fish within the area. The plant sucks in the yearling fish and also changes the salinity of the water within the area. The place where the most cisco are found is where Old Nuiqsut, currently Helmericks fishery, was located. Causeways could block the fish from traveling between the Mackenzie and Colville Rivers. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

They are extracting gravel from Napaung Lake. This will affect the Broadhead and Whitefish. The lake is very long. When they pump these lakes it takes away the food source

of the fish. At Oliktok, there is a large salt water intake. How big is the screen? Is it small enough that it doesn't suck in the food source for qaaktaq and other marine animals? (Nuiqsut active harvester. SRB&A Interview 2007). (SRB&A 2009)

The changes are the burbot, that eat the fish. The burbot are more slimy in their skin, and the liver has changed; the taste of the liver has changed, the burbot liver. I don't know, maybe after that one big mud [discharge], when they drill and also when they are near Umiat, and there's a lot of debris in the Umiat area. We found out now that burbot, after they found out that they had PCP in the livers. The elders that have been eating those have died from cancer. (Nuiqsut) (SRB&A 2013c)

*Before development began the abundance of fish was higher and the fish were fatter. Since the development started there has been a low recruitment of fish and they have become skinnier over the years. (*Nuiqsut) (MBC Applied Environmental Sciences 2004)

There was a decrease of Arctic cisco in Colville after a few years of the HDD drilling. Since it is up and operating and drilling has stopped, it seems like the Arctic cisco run is getting better. Now the fish counts seem to be getting better, perhaps because there is less industry activity, less underwater drilling. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

We don't know how much, the ones that affect the areas where the fish travel on these rivers and the activities that are going on in the Colville [River] are the ones that really affect our area. Last spring we didn't get hardly any fish over at Chandler and Shainin Lake. Like the alpine development; that's really affecting us. Do fish migrate? The activities on the Colville River, those that drain in there, that affects us. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Not on a regular basis. A major oil company here on the North Slope was fined heavily for illegally dumping at Endicott, which is on the migration route of the Arctic cisco to the Colville. I feel that illegal dumping is a serious problem, whereas five kids playing in a swimming hole is probably not the problem that has wiped out the cisco. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

There was a decrease of Arctic cisco in Colville after a few years of the HDD drilling. Since it is up and operating and drilling has stopped, it seems like the Arctic cisco run is getting better. Now the fish counts seem to be getting better, perhaps because there is less industry activity, less underwater drilling. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

3.3.5 Birds

Black brant, you can catch those up here [directly east of Barrow], and if you want to harvest large [amounts] you can go [here] [Wainwright area]. Black brant are not my favorite type of geese, but if I'm in the area and I can harvest them, I harvest them. When I go eider duck hunting over here [in the lagoon], the black brants sometimes fly back and forth where the eider ducks fly south. The black brants fly back and forth between feeding grounds. (Utqiaġvik) (SRB&A 2010a)

That's pretty much it except for on the spit, there's lots of eiders along the whole lagoon spit, lots of eiders. The whole thing; I've seen eider nests throughout the whole spit from

here to Icy Cape. They don't nest too far apart, from here to the wall and there'll be a whole pod of them. (Point Lay) (SRB&A 2011a)

All those birds I tell you about, they go all along the coast. After they're born, first two weeks they stay around there, then we see big bunches of babies floating around the lagoon. Inside the lagoon. Hundreds and hundreds of birds. They raise them in the lagoon. All the way up to Icy Cape we always see babies bunched up. (Point Lay) (SRB&A 2011a)

Eider ducks, geese, swans, loons, and there's aahaaliqs [long tailed ducks], what you call it in English? Always see them raising their young all over the lagoon. They call them isas. (Point Lay) (SRB&A 2011a)

[The brants are] mainly inside the lagoon going south. We're always seeing them in the lagoon. They go from point to point (in the spring). They hit the points like this and fly this way and head over. But when there's open water they seem to fly over the open water a lot. (Point Lay) (SRB&A 2011a)

All along the coast, the whole spit is key habitat for the birds nesting, all over. Up Kukpowruk River, in all the lake areas [there are], loons, terns, everything, swans, cranes. I have never seen a crane egg but a swan egg. I saw a nest that was abandoned and they never came back. (Point Lay) (SRB&A 2014b)

There's an island at Kukpowruk. That's called Snow Goose Island, The big one. That's where there's a lot of snow goose end of June. Elders used to tell us where to go for that [egg harvesting]. If you want to get snow goose eggs, don't get too much. Plus [they nest] right from the village. I think it's this one [lake] here [near Point Lay]; it's got to be this one. That's where the Canadian geese go. There'll be hundreds of them end of June. Canadian geese. They're nesting there. Swampy area around that area, it must be their food. (Point Lay) (SRB&A 2011a)

There's some birds that don't normally come this far north, but they do nowadays. The weather warming up, they have more areas where they could raise their chicks and produce, reproduce. (Point Lay) (Braem et al. 2017)

Also at the mouth of Niglingaurat black brant used to nest there by the hundreds. There were so many that they looked like bowls from a distance filled with eggs. We could have hunted them if we chose to. When they flew away, it looked like there was a big, black cloud. But we do not hunt them. (Nuiqsut) (BLM 1998c)

When the thin ice near the mouth of the river breaks up, that is when they start duck hunting. We, the residents of Nuiqsut go there to hunt for ducks when they arrive. I do not know how the ducks that nest along the sea coast are doing because it has been so long since we lived there before we moved back to Nuiqsut. There is a very big nesting area along the sea coast though but since we moved here some time ago, we do not know whether it is still that way. (Nuiqsut) (BLM 1998c)

Back in, when I was beginning to be a boy, my parents, they owned a canoe. So we have to go down the coast when the, when they, after all the ice caved. We had to haul some driftwood for when, winter use, along the coastline. There used to be some, these stellar eiders just bunched up in one spot, another bunch, another bunch, in the summer months, after they nesting in the, in the, up inland. They stayed along this coastline in a big bunch, you know, in bunches, bunch, bunch. But for the last years that I have

known, have seen my, personally, I haven't seen any flock along this shoreline for the last few years. I don't know what, what became of those ducks. Kenneth Toovak (Utqiaġvik) (MMS 1982)

Birds, migratory birds nest quite a bit around the delta...Also, quite a bit of goslings and nestingers (ph) from Iysuk (ph) by Cape Halkett along the Harrison Bay to Fish Creek near the Ocean on those swampy areas. (Nuiqsut) (BLM 1998c)

I'm not sure about what kind of studies were done on the National Petroleum Reserve or how many studies or how far those studies went because it is warming up here in the Arctic and we're kind of warming up at a rapid rate up here and you know we're starting to see new species of bugs, new species of birds traveling this way. (Point Lay) (BLM 2019b)

They're all over that flat [spit]. [There are] all kinds of eggs, even seagull eggs. The birds lay right in the flat area there. Eider ducks, seagull, aaqhaaliq [long-tailed duck], Arctic tern, geese, and all them birds, they always lay eggs right there. Always in June, they lay eggs. (Point Lay) (SRB&A 2014b)

Right here [mouth of Kukpowruk River] is where they feed, I guess, or rest. Probably both resting or feeding, last year me and my uncle saw maybe 1500 take off at once. They were all bunched up all in this area. When you look up to the sky you could see nothing but ducks. (Point Lay) (SRB&A 2014b)

Phalarope. There used to be millions. You don't hardly see them any more. The whole shoreline used to be covered every time in the fall. And you don't see them inland where they nest. (Utqiaġvik) (MMS 1982)

Same way with these, these little birds, snipes. Used to be in the fall, along the beach, just hundreds of it, along the beach, you know, in the ocean. But same, same thing. They're gone. Maybe you'll see one or two there, this and there, but not hundreds anymore. (Utqiaġvik) (MMS 1982)

I think [when] the weather changes, animals come early like the geese. We were trying to go by the calendar by how we used to hunt them and by the time we get there they have already gone north. (Anaktuvuk Pass) (SRB&A Unpublished-a)

That is where they all nest, all the way over here and on the channels. They go in the wetlands. We could see all of the nests over there, just hundreds of them. That's where all of the eiders and King Eiders and the Brants nest (by Oliktok Point)… (Nuiqsut) (SRB&A Unpublished-b)

There are different waterfowl that are coming up here; they cannot be named because they are new to the region. The sand hill cranes used to be much larger and there are stories that they killed people. We have them up here I have shot them before. I didn't know what to do with them when I shot them. The one mate started circling me and it kept going up and up and it disappeared… I buried the other sandhill crane. Some of these birds must have been huge to where they could kill people. (Nuiqsut) (SRB&A Unpublished-b)

Ravens too, they were gone for a while and now they are starting to pop up again. I saw a swan in October. We saw a lone swan after freeze up. It must have been lost, it looked

weak. Someone maybe shot the mate because if that happens then they die too. (Nuiqsut) (SRB&A Unpublished-b)

Teshekpuk Lake Special Area

In addition, this is also Carroll's testimony, in addition the entire area around Teshekpuk Lake is an extremely important habitat for waterfowl nesting, molting, and feeding should be excluded from leasing, exploration, and development there for that reason. (Utqiaġvik) (BLM 2019a)

In addition to the area north of, this is the last page of Carroll's transcript, in the area of the lake it is extremely important for habitat of molting black _____ (01:30:35.85) and then Nesting White Footed Geese and the construction of a pipeline could be very detrimental on these populations. (Utqiaġvik) (BLM 2019a)

The area to the north and east of Teshekpuk Lake is vitally important for many molting geese. Up to 20 percent of the entire Pacific flyway population of black brant can molt in the Teshekpuk area at any one time. This is a great concern that molting birds are susceptible to disturbance and any activity in these areas has a potential to greatly reduce the population of brants and other geese. Also in the area there are relatively dense populations of king eiders which are very important again for subsistence and king eider populations have declined by about 50 percent in the last 20, 25 years. There are also many other species of waterfowl that are important in this area and we need to learn a great deal about them. (Utqiaġvik) (BLM 2003a)

Effects of Development on Birds

I'll go get your oil from your part up here and then when you look at this area up here this is the nesting ground of the migratory birds of this planet. This is where they go nest. We saw what happened to the Snow Geese in Prudhoe Bay. They were chased into Canada and once they got there they overpopulated. Now their nesting ground in Canada is destroyed. Where the Snow Geese going to plan for home now? And we're going to do that to all the other animals? Let's get our Secretary to do the work right and first take care of our private property we need and then two to look at our climate, how we're living in it. It's not important to go after oil and gas when you can save all the species that migrate and when you go to the ocean it gets scarier yet. (Utqiaġvik) (BLM 2019a)

I do have a few other wildlife issues and concerns and these mostly have to do with birds. The first is oilfield activity or the development of oilfields on the North Slope has most likely increased -- well certainly has increased some predator populations and has mostly likely led to the increase of other predator populations. And the predators I'm speaking of are foxes, ravens, and gulls. Part of the issue is garbage and that garbage has allowed -- has provided additional food sources for these predators. There's another issue that's out there, though, too, and that concerns mostly ravens, but foxes as well, and that's -- there are places where ravens can now build nests or foxes can den or take their young. And so those are some of the reasons that the predator populations have increased as well. The result of those increased predator populations has been a decrease in the productivity of many birds that nest within the oilfields and many of those birds are important for subsistence. (Utqiaġvik) (BLM 2003a)

These wildlife folk that see it—they've witnessed, I guess they are wildlife folks, that walk in the country and [are] looking at birds and things in the Colville River Delta,

maybe the east side, down by Ulumniak (ph), that's next to—not far from the old Nuiqsut site, they're monitoring these birds and go to and from these places with a chopper—upsets, disrupts, displaces—perhaps some of [our] only opportunity to go get…game, especially caribou, in the area are scared and may…run off because of these impediments that arrive [and] are not natural. Naturally, [we] would walk along the coast where they're at and be able to harvest…caribou. (Ruth Nukapigak, as cited in USDOI, BLM, 1998, NE NPR-A Scoping, Nuiqsut). (MMS 2007a)

I have gone how many times to Inigok where there was some drilling that took place, and I have seen bones from birds that have been killed from the, from after they drill a hole, the stuff they leave behind, the fluids. I don't want to see that kind of thing happening where we see our wildlife and waterfowl dying from contaminants being left after having conducted drilling activity, I don't want to see that kind of thing. And leaving an area without having done some kind of thing to put it back into the shape it was before the drilling took place. (Atqasuk) (SRB&A 2003)

Now, let's look at what's going to happen after you discover the oil: you're going to have to lay roads, you're going to have to lay gathering systems, you're going to have to lay buildings, you're going to have to lay pipelines. And when you start laying pipelines, then you start harassing animals like spectacled eiders, steller eiders, snow geese, the peregrine falcon, those kind of animals are going to be bothered. When I, as a person, shoot one of those animals I can get fined up to $10,000 and put in jail up to five years. What does the industry get when they damage those animals? What do they get? Nothing. You might give them maybe a $10,000 fine, but heck, that's the price of developing, it's very affordable. But me, that live here, I go to jail...And when you start your development and you endanger those animals that are endangered -- that are on the threatened or endangered species list, when I do it I become a criminal. What are you when you allow it to be done? What is BLM? What is the State of Alaska? When they allow these threatened animals to be endangered you are a criminal too. And it becomes premeditated because you plan it ahead of time. (Utqiaġvik) (BLM 2004c)

3.3.6 Terrestrial Mammals

See traditional knowledge provided in the ACOUSTIC ENVIRONMENT and WATER RESOURCES sections for traditional knowledge that is also applicable to this section.

Caribou

Teshekpuk Lake Habitat

With all these possibilities we are likely to have ample oil revenues in the future. This greatly reduces the motivation to restore and develop the crucial wildlife habitat areas such as Teshekpuk Lake and the Western Arctic Special Area and the Colville River Special Area. We should continue to protect these areas. They are very important to wildlife and subsistence hunting. End of Carroll's transcript. (Nuiqsut) (BLM 2019e)

You also ask our opinions for areas where there should not be pipelines. Again, the area around Teshekpuk Lakes should be avoided, one of the worst places for a pipeline would be just north of the land. A pipeline running east and west would interfere with the ability for the caribou to travel towards the coast or encourage _____+ (01:29:51.86). It would also impact caribou moving south away from the insect relief area grazing areas where weather conditions are favorable and insect harassment is

reduced. This would have a negative nutritional effect especially in the years that conditions cause the trail to the insect relief areas and that back and forth multiple times. Every age _____ (01:30:16.45) through the herd uses that area so it would affect the entire herd. (Nuiqsut) (BLM 2019e).

Please take notice that Teshekpuk Lake is the core habitat of what we subsist on. This area supports the caribou, fish and waterfowl habitats. If this area is disturbed, you have no idea what detrimental effects it will have on our resources in the long run. (Utqiaġvik) (BLM 2004c)

And our caribou always go down to that Teshekpuk Lake or for the -- they always come through in springtime to go down north to that Teshekpuk Lake. And then after they have their calves in the fall time they -- if somebody don't scare them off on their way coming this way, they usually come back in the fall right through our village and that's how we have our food gathered up for winter. (Anaktuvuk Pass) (BLM 1998b)

We need to be very careful there because this planning area is starting to get over into the calving area of the Teshekpuk Herd. There are very -- there are narrow migration corridors over in that area that the herd needs to move through and it's an important insect relief area. Insect relief areas are very important to a herd because during the summer when the bugs are driving them crazy, they need to be able to get out and get relief from the bugs and they also need to be able to get into feeding areas. So, you know, as work progresses in that direction, we need to be extremely careful not to hinder the movement of the caribou to their calving areas and their insect relief areas. (Utqiaġvik) (BLM 2003a)

The west side [of the proposed area of development] is getting over into the Kogru River area in the area that was originally excluded from leasing because it's extremely important for waterfowl, nesting, and molting, and it's also very important as a caribou calving area. This, of course, is getting over into the Teshekpuk region and our Teshekpuk Caribou Herd, which is the most important subsistence caribou herd for most of the villages on North Slope. For the villages of Barrow, Nuiqsut, Atqasak, Wainwright, this is the herd that we hunt and this is the one that we're very much dependent upon. (Utqiaġvik) (BLM 2003a)

The caribou migration and the Teshekpuk herd is the most important component of our wildlife here on the North Slope. They don't migrate as much so -- as essential caribou herd does, or porcupine over to the east. Teshekpuk caribou herds is always on the North Slope, they don't go no further than the foothills in the Brooks Range. (Nuiqsut) (BLM 2004d)

Nearly all of the parturient cows move north through the narrow corridor between Teshekpuk Lake and the Kogru River. It would be very difficult to have any development in this corridor without the risk of seriously affecting the population. However, this corridor is part of the area that BLM has proposed to open to leasing and development. (Utqiaġvik) (BLM 2004c)

The Teshekpuk Lake herd uses the planning area for calving, like the gentleman just explained to you, feeding, insect relief, and 19 percent of the time, for over wintering. (Utqiaġvik) (BLM 2003d)

Even the caribou know that their calves have a better chance of surviving if they can just get to the narrow corridor to the east of [Teshekpuk] Lake. The Teshekpuk caribou herd somehow gets enough sustenance from this area to winter in the North Slope, unlike other Arctic caribou herds that head south. It is from this herd that the Inupiat who live here get the majority of their year's supply of tuttu meat. (Utqiaġvik) (BLM 2004c)

The area to the southeast, the east and northeast of the lake, Teshekpuk Lake, which is critical caribou calving area. There are probably ten to fifteen thousand caribou that calve in that area each year. And also to the north of the lake, that entire area from the Beaufort Sea coast to along the northern edge of the lake and on over to the Ikpikpuk River area are all fairly crucial insect relief areas. The movements of this caribou herd during much of the year are somewhat erratic and unpredictable during the fall and the winter they go to many places, but what is predictable about this herd is that most of them show up in that area east of the lake and pass through that area between the Kogru River and Teshekpuk Lake every year, that's pretty consistent in that most of the herd will be seen north of the lake in the summer, usually up to twenty-six to twenty-seven thousand caribou can be counted in that area. It's pretty hard to imagine that any development could occur in some of these critical areas without being detrimental to that caribou here and incidentally this is the herd that most of the villages on the north slope harvest. It's the primary herd for harvest in Nuiqsut, in Barrow and Atqasuk, and many years it is in Wainwright. It's kind of split in Wainwright between the Western Arctic herd and the Teshekpuk herd. The Teshekpuk herd is smaller than some of the other herds but probably more important on a subsistence basis to the people of the North Slope. (Utqiaġvik) (BLM 1997a)

There used to be thousands of caribou in that area in the 70s. [For the] first time we see a little bit of herd this summer come from the east, because the migrations of the caribou has changed a lot. The Porcupine Herd comes from the east, that's along the coast, and the Teshekpuk Herd comes from the west; that's the western herd. The migration of the western herd has diverted southward. We used to see them coming in from the coastline, but now we see them coming from the south. Mainly [because of] too much traffic. Bow hunters and head hunters. I think they don't usually wait for the first herd to come by and then the second herd gets diverted. (Nuiqsut) (SRB&A 2015)

Other Important Caribou Habitat

Another place where there should be no leasing is the Western Arctic Herd special area in the southwest part of the NPRA. The area contains the calving area. For the Western Arctic Caribou Herd there are several important migration corridors. The trauma and activity in that area would be detrimental for the herd. The Western Arctic Herd is an extremely important subsistence resource for some North Slope villages and many villages in the northwest part of the state. (Utqiaġvik) (BLM 2019a)

That [caribou calving] would be in Kukpowruk area; in October when we are fishing they are all over, that is where they are calving, that whole area. They usually are there every October. For some reason they didn't make it there this year. (Point Lay) (SRB&A 2014b)

We get [one] herd coming from the south and [another] herd coming in from the north. We get the best of both of them. They're calving, giving birth. This whole area right here [south of Wainwright] because of all the vegetation. (Point Lay) (SRB&A 2014b)

They seem to be coming down behind Wainwright, and back behind us toward the mountains. When you see them along the coast, it's smaller groups of them. October, mainly. Sometimes they're right in our yard. They winter here. (Point Lay) (SRB&A 2014b)

We don't go south in July because all the caribous are out here [indicating an area from Anajuk Point northeastward to Qulvi], all the way, all the coast. ... It's cool over here. We start feeling the ocean breeze around [Anajuk Point]. When we turn, right when we turn, you know, there's the breeze, ... and that's where the caribous are, from right here [at Anajuk Point], you know, all along—where they should be. (Nuiqsut) (HDR Alaska 2015)

Other Caribou Observations

It's unusual to see our caribou in the dead of winter; they're mostly south at this time of year. The weather trends [are affecting the caribou]. (Nuiqsut) (SRB&A 2015)

Looking at your Alternatives A, B, C, and D, it's a --it's a real coin and the toss issue for me with our caribous being in that location right in October. Maybe there's global warming taking effect from past ten years up here. We used to get caribou migration during September. Last year I think they came in December. And we're in October, and there is no caribou migration. I -- I like Alternative A and also D, but I would also benefit from C -- B and C. With exploration being up there, it would be able to misplace the caribou herd, possibly changing those herd, sending them south -- southward bound toward Anaktuvuk. That's where we would also benefit. It -- it's exploration versus subsistence. That's the type of my -- my thinking that I've been thinking. All these alternatives are good. I've -- I really want to benefit. Maybe I'll -- I'll leave it up to the caribou herds. If there was full-scale exploration to move those herds southward, that's where we would benefit. If there is a lot of structures in that area, maybe we'll benefit year round up here. (Anaktuvuk Pass) (BLM 2007)

We're seeing the changes. The caribou have problems. Lesions on the liver with a bad cover. They have lesions on the joints and internal organs. We asked the North Slope Borough about testing, but they said they have no budget for that. Where do we turn to identify the problems? (Nuiqsut) (BLM 2003b)

When the caribou was in short supply we would travel to Tasiqpak knowing that we would find caribou and to the area close to Kuuguluk. Before we moved back to Nuiqsut I used to also do my hunting at Umiat. That area is a prime hunting ground… (Nuiqsut) (BLM 1998c)

Back in 80s and 90s... [caribou] used to go right up to village and turn that way and some of them would pass that creek we always go through, and some would pass that and go to Itkillik River and go back out, and not anymore. The closest caribou I ever caught was two and half miles [from the village]. (Nuiqsut) (SRB&A 2014a)

Normally they come through this oil field right around here and I have been doing a lot of hunting on this side and we haven't seen much caribou over here. Half of the caribou we catch are sick. Green, yellow. They have big pus bubbles the size of my fist. (Nuiqsut) (SRB&A Unpublished-b)

Yeah, it's different now, the migration. I know that years back it used to be end of June, July. Now I think it's later than July and the herds are smaller. There's smaller herds

down there. I think because of the pipeline over here. They say it's not affecting [the caribou], but it is. They're coming later and later. If you get an aerial thing [picture], you can pretty much see the footprints of the caribou, coming east-west like [local elder] was saying. Since they made the other pipeline going from the river crossing, it has changed, too. (Nuiqsut) (SRB&A 2010a)

Porcupine Herd that comes to Kuparuk, they changed from there and some of these in Central and Teshekpuk are slightly changed in timing, July most of them are on the coastline. There were times in July that all the caribou were on the coastline until August-September. (Nuiqsut) (SRB&A 2010b)

I guess the caribou are more skittish nowadays. People are approaching them and they are gone. Before they used to just hang out and you could drive by them with the boat and they would just look at you. Now when they hear that outboard motor they are gone. They are more skittish nowadays. Maybe it is that aircraft activity. There is a lot of traffic out in that area. (Nuiqsut) (SRB&A 2014a)

This year we didn't get no caribou. What would BLM do that would help our community that was impacted by no caribou at all? No migration because of that infrastructure that are being built north of our community, and the activities that are going on no north of our community. And for 50 years we had— or more than 50 years we had depend on caribou. And every time we get no caribou, we don't get no disaster funding. We get help from Wainwright people. We get help from Barrow people, from Nuiqsut people. [unclear] 13-15 caribous at a time. But that's not BLM helping us. It's our own entity that's helping us. We're being impacted, but like the community that we are depending on caribou all our lives. What kind of impact funds that we have BLM would do for our community when this happens to our community in every year. To those sport hunters, activities going on up North and all that infrastructures that are being built. What kind of impact funds that would —anybody that would help our community. We tell you guys over and over we've been impacted for years. We never get any disaster funding. We get help from the other villages. Last year we got to help from Kenai. They sent us some fish. I really appreciate Kenai for helping us. They understood us. But for years, we told you guys over and over who are these people that are affecting us? We don't get any disaster funds. We don't get any help from BLM. Nobody except from North Slope Borough or the communities of Wainwright, the community of Nuiqsut, or the community of Barrow. If there was some kind impact fund, what would this kind of situation be reported? Because we're telling you, over and over, about our situation about the caribou. (Anaktuvuk Pass) (BLM 2018a)

Caribou is still important right now. From years and years from when I was a little boy [caribou has been important]. Guide hunters, well, they push the first caribou and [the caribou] turn around and go someplace else. And we wait and wait and wait [for the caribou]. [Traditionally] we wait until they pass the village, three miles down and then we start shooting them. They [the ones that pass] don't care, they [other caribou] just come by. (Anaktuvuk Pass) (SRB&A Unpublished-a)

In springtime we hunt the caribou in April, May. [They come] from the south. Sometimes [in] October [the caribou come] from the north. (Anaktuvuk Pass) (SRB&A Unpublished-a)

TAPs has a lot of negative impacts because the Dalton Highway is open to the public. Our caribou, the Central and Porcupine herds, go through the Sag. River and they are

diverted by bow hunters. These folks have access to it, they can come across the right-of-way but they are not allowed to walk along the road because that is private property. I have run into so many people looking for wounded caribou which they have shot and are looking for caribou. A lot of impacts from TAPs are happening today. Any of these still, if only ADF&G could put seasonal [restrictions] on these bow hunters then our caribou would be able to come across the Sag River and move westward. We do not see 1000s of caribous coming this way anymore. There have been a lot of impacts and what kind of programs have they done to us? Nothing, none. Even though we are impacted these programs were not given to the community. That is what I have seen and experienced. (Nuiqsut) (SRB&A Unpublished-b)

Caribou Calving Sensitivity to Disturbances

The challenge is to decide where to draw the lines between where petroleum exploration and development occur and where wildlife and subsistence values are protected. In the past planning processes, we have come up with compromises where leases were available for much of the NPRA but the critical wildlife habitat areas were protected. You asked us to outline areas that should not be opened to leasing, exploration, and development. Teshekpuk Lake continues to be one of the most biological productive areas in the circle polar arctic that should be protected. The area just south of the lake is extremely important for caribou calving of the Teshekpuk Lake Herd. The area north of the lake is critical for insect relief. The areas east and west of the lake have narrow gaps of land that are important migration corridors. Most of the cows and calves migrate through this narrow gap between the lakes and ____ (Cogro? 01:27:10:42) Inlet to the east and cows and calves are particularly sensitive to roads and cows and calves are particularly sensitive to roads and industrial activity at the time of calving. (Utqiaġvik) (BLM 2019a)

The pipeline should not run within forty miles of the south side of the lake because of the caribou calving area. They should not be run through the narrow gap of land between the east side of the lake _____ (Cogro? 01:31:03.11) Inlet because it's a very restrictive and important caribou migration area for cows and youth calves to travel to get insect relief. Cows with calves are very sensitive to structures and activity and would be detrimentally affected by construction of the existence of the pipeline to that area. There should also be no pipelines running through the calving and insect relief areas of the Western Arctic Herd. There should no pipelines running along any of the major rivers because of the danger of a spill destroying a major subsistence fishery. Even pipes running across the main _____ (01:31:42.07) could result in major damage to a fishery. Pipes should not be run in areas where there are a lot of subsistence camps where people commonly come because it would lower the volume of those people's lives. (Utqiaġvik) (BLM 2019a)

The females have effects during calving. They're under a lot of stress. They lose a lot of little ones. (Wainwright) (SRB&A 2009)

...there is a narrow corridor of land between the east side of Teshekpuk Lake and the Kogru River, which nearly all of the parturient cows must travel through shortly before or after calving to get to insect relief areas. Cows with calves are very sensitive to disturbance, so we have the most important segment of the population passing through this corridor during the time of year when they are having calves and are most sensitive to disturbance. Development in this corridor and the calving area south of there could have a detrimental effect on the herd. (Utqiaġvik) (BLM 2004c)

Very important that the calving area right by Teshekpuk Lake there should be no allowed for oil drilling and disturbing the caribou herd there. Also caribou migrate route from that area through Anaktuvuk roads, Chandalar Lake area. During the fall migration, there shouldn't be no activities. Also spring migration from south, if they start going down to the -- towards north, there should be no activities in the way of travel north and south. (Anaktuvuk Pass) (BLM 2007)

It is very important for pregnant cows to get to and use the calving area, which is south, east, and north of Teshekpuk Lake. Over ninety percent of pregnant cows calve in this traditional calving area. During years when cows can't get back to the calving area, calving success has been much lower than years when most of the cows did get back. (Utqiaġvik) (BLM 2004c)

Effects of Development on Caribou

And I notice that game appears thicker along the pipeline corridor than it does in other areas and I believe that the phenomenon that the Mayor spoke to earlier about the pipeline deflecting the game is, in fact, a converse. I believe it is an attractant, it's luring, if you will, game away from areas which may have traditionally been used by subsistence hunters. So I think the effect that people are experiencing, a decrease, perhaps in game density is real but the effect that they are scribing to it is as a deflection is, in fact, incorrect, it's actually an attractant. And I attribute this to two phenomenon. I'm not a scientist, I'm an economist by training but I do observe these game patterns on an annual basis. First of all, the dust from the Dalton Highway spreads out and settles on the snow and then when the sun returns, that's the first areas that become snow free so the game then, rather than having to paw through the snow, the caribou especially and the ptarmigan, are attracted to this corridor and then the predators follow suit. So the best place, if you want to observe game is actually up and down the Dalton Corridor, especially in the spring. The second phenomena that I attribute this attractant phenomena to is the fact that it's something of a hunting sanctuary, you know, there's the 10 mile Dalton Highway Corridor which is limited to bow hunting only and the entire area around Prudhoe Bay is closed. And it doesn't take game long to figure where they're not persecuted. And as I think as you experience in other areas where there's a game refuge, that's where all the game is especially on opening day of hunting season. I think the caribou have figured out rather quickly that they're safer from hunting along the corridor and then the Prudhoe area and so tend to collect there. Mark Helmericks. (Utqiaġvik) (BLM 2002)

It will be about 12 to 15 that we average in that area. It was less than that. Too much air traffic. That is the main problem, is that during summer there is too much air traffic. The caribou is unable to come near this area. Conoco has an interest in this area too [Fish Creek.]. (Nuiqsut) (SRB&A 2010b)

Fish Creek towards Tingmeachsiovik [River], before they put the bridge on, [there] used to be caribous around there. They used to hang around there, but I don't know. Now [because of] that bridge they don't go over there. Used to be some, lots of caribou out that way [by]Atigaru [Point]. And [now] hardly any caribous. They used to go look for caribous around there. (Nuiqsut) (SRB&A 2015)

Only thing I could say is they're confused, because they get to this area where they usually go and they can't go there. They're trying to find any way to get to the west side. This one was about, I'd say more than a thousand, but one went a few miles and

crossed. [They're] lost. Migration where they've been going has changed. Where they're used to going they can't go anymore. They have the pipeline by CD3 they have to go farther. Same way with the pipeline that goes the other way. I'm surprised that they even go past that. Some will go. Ever since they put that up they only go through there the west side. (Nuiqsut) (SRB&A 2015)

Ever since the pipeline came in from Alpine to 2L, the caribou migration's been different. When I came in in '93, we caught 12 caribou in by Nanuq, and since then I've never seen them come through that area. Since the pipeline came in, they don't go through the village any more. We caught like 12 bulls, and we never seen caribou in there again. And that's definitely an impact. (Nuiqsut) (SRB&A 2014a)

The pipeline, wish they could change it to make it more dull. They [the caribou] think it's ice, so they think they need to stop and go back from where they come from. Summer time I can see it from my house. Pipeline and helicopters [are] probably the two main distractions for caribou in this area. That pipeline needs to go. (Nuiqsut) (SRB&A 2014a)

The pipeline keeps them from crossing. Not like they were crossing [before], because the Western [Herd] and Porcupine [Herd], they normally come this way, but last two years they've been on Point Thomson side, Prudhoe side. I haven't seen a Porcupine herd in how many years? (Nuiqsut) (SRB&A 2014a)

[For the] first time we see a little bit of herd this summer come from the east, because the migrations of the caribou has changed a lot. The Porcupine Herd comes from the east, that's along the coast, and the Teshekpuk Herd comes from the west; that's the western herd. The migration of the western herd has diverted southward. We used to see them coming in from the coastline, but now we see them coming from the south. Mainly [because of] too much traffic. (Nuiqsut) (SRB&A 2015)

Fumes: When the caribou smell exhaust fumes, without even looking they will go. When they smell man or combustion, the noise, they go up straight inland. That's why you don't let them smell you when you're hunting. You have to get upwind. I think there are a lot of caribou around Prudhoe. When I worked there I noticed that somehow the smell doesn't bother them. But around here they're bothered. (Barrow active harvester; Experience timeline: since 1950 and ongoing; Experience location: Barrow area. SRB&A Interview 2007) (SRB&A 2009)

I've heard from other hunters complaining about caribou looking sick. I caught a couple maybe two or three years ago. It's possible. I think the caribou are getting sick because of the flares they are burning over at Alpine. You see this dirty air. And we have north winds a lot of the time when they burn that yellow smoke and it gets deposited on the tundra. That's why I think the caribou are getting sick. (Nuiqsut active harvester; Experience timeline: 2004; Experience location: Just up the river. SRB&A Interview 2007) (SRB&A 2009)

The caribou on the west side of the village, some are okay on the ocean side but the ones closer, the one I got was a sick [one.] I decided to not even bother to hunt [that type of] caribou because they're loners, and the loners are the ones who hang around [the developed areas]…they're protecting themselves from the bears and wolves and they're using the pipeline as coverage. They can get close to the Alpine or the village, and the wolves won't. They have peace away from the other carnivores. They're picking

up air quality damages or something. For us, when we ingest something wrong, we get heartburn or hiccups. I think they do that to, they get the same thing but it stays in them like cigarettes. (Nuiqsut) (SRB&A 2011b)

Just the flares that are always going. I kind of think that's why they are getting sick. Flares are on 24/7, and I think that mercury is making them sick. The [pollutants are in the] air and drops down to the ground, and [gets on] the food that the caribou eat. (Nuiqsut) (SRB&A 2014a)

There's always caribous on this side of Itkillik and not too far from Itkillik-Pa…. I go up inland. There's always caribou there in August. Plus, there's always helicopter flying, doing their survey, and I don't get caribou just for, you know, the helicopter [to come] bother me. There was [a] helicopter doing their survey [over] Itkillik-Pa and on this side of Ocean Point. There's always caribous [there], but there's always helicopters disturbing [them]. That was in August. (Nuiqsut) (SRB&A 2014a)

In the beginning you were mentioning that the Secretary of the Interior had the authority over this NPRA, how it works. What's so hard about the Secretary of the Interior settling the ownership of the land inside the NRPA? What is holding him from doing that? And when you're looking at making roads and pipelines and wealth like that you know the structure of the North Slope. You have a calving area at Teshekpuk Lake. The caribou after they are born _____ (01:08:07.41), swing by Nuiqsut and head up toward Anaktuvik. Then after Anaktuvik they all head out west. This is their natural migratory path and we also know that when you lay a pipe in front of their path the caribou no longer uses that path. Knowing this you would endanger the ability of _____ (01:08:33.81), Nuiqsut, and Anaktuvik and probably up into Wainwright of the migration of one herd. We watched what the other herds have done over further east, east of Prudhoe Bay and in Prudhoe Bay. They don't follow their migratory paths anymore. We should have learned something from this but I don't know what's going on there when it comes to the learning part. The caribou will not cross a pipe, with have a pipeline right there or a gas line going to the east field over fifty, sixty years. The caribou still don't like to cross that piece of pipe right there. It's alive to them and it scares them and then we start laying pipelines all over the North Slope. The caribou is going to be the first animal to go. (Utqiaġvik) (BLM 2019a)

In those things we recognize some of the hurtles and we also recognize the current state of infrastructure on the Slope from North Star, from ENI _____ (01:33:57.79) Development to the Hooper Development using unstable areas on the North Slope that are um free from permafrost issues that's why they call it thaw stable areas and the pipelines that are buried in these areas are um part of the future dialog in the technical report of how change in dynamics of local climate change issues and, and other areas that BLM needs to consider about thaw stable areas along rivers being the Trans Alaska Pipeline, if you go down the highway there's about a forty mile section of that pipeline that's buried in the thaw stable section of the _____ (Sauanatuk? 01:34:58.76) River on the Snake River in that, in that river corridor where it's thaw stable. Those are some of the things that have not been highlighted and they are important features of development not just because they are out of sight and out of mind, because of the more important needs of the free movement of terrestrial animals. (Utqiaġvik) (BLM 2019a)

[My] biggest concern is the caribou migration, if the oil exploration would bring a pipeline. The migration passes through Wainwright almost every year. I've lived here since 1991. I get my yearly supply of caribou in September and October. I've heard

from people in Nuiqsut: once Alpine came in the caribou migration was affected. (Wainwright) (SRB&A 2009)

There used to be a lot more caribou, but it's getting to be a lot less going to that area. Because they're getting diverted in Meltwater. The pipelines from Meltwater to Kuparuk are so low and they can't cross the pipeline. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

Well, the pipeline is a problem. When you look at it, it is reflective. All that pipeline that comes to Alpine and goes to Kuparuk, it shines and it looks like ice out there. The caribou look at that and they are re-routed. If you come here in the summer time, and look, it looks like a glaring ice pack out there. And we told Conoco Phillips that the caribous that are coming from the east side and the west side, they need to do something about the pipeline. It goes all the way from Colville all the way to Kuparuk and where are the caribous? Some of them do migrate all the way through there. And once they see that pipeline, the caribous think that they are close to the ocean [that's why they reroute]. But on this side [west side] you don't have that yet. (Nuiqsut) (SRB&A 2010b)

He knows that Teshekpuk has never changed much, they still go on the migration of their past. Central Herd is same general area, but changed slightly, because low water happened and some pipeline in Meltwater. Can't come across it, and that's why it's up, caribou can't cross to the other side. They go around the pipeline. Some of them [pipelines] are real low. Make sure they are seven feet [tall]. The older ones are those ones deflecting the caribou [new pipes are better, taller]. (Nuiqsut) (SRB&A 2010b)

I never seen a real lot of caribou. Back then we used to have a lot. There'd be a lot more caribou in this area than compared to the west, Teshekpuk Herd. When they'd migrate there'd be more. In the 50s there's lots of caribou used to cross right down there, in the summer time. Never do that anymore, hardly. They start CD3 and Alpine, but that Tamayayak River used to have lots and lots of caribou but hardly any more. CD3, the people told Alpine, there's hardly any here. There used to be a lot of caribou that migrate right here, they don't do that anymore [by the coast]. (Nuiqsut) (SRB&A 2010b)

The Porcupine Herd that comes from Canada through here, when the pipeline, when it went all the way to the Meltwater, when they build that pipeline to Alpine, they stopped seeing them. Oliktok, to Meltwater. (Nuiqsut) (SRB&A 2010b)

They start to come in late, they used to come in early, now they start to come in late. Right now, there's nothing there and Teshekpuk stay around there most of the time. We can't get any caribou around here, there's the pipeline and Kuparuk [even if the caribou were there]. This is the caribou area. Nowadays they gonna get the caribou [south]. (Nuiqsut) (SRB&A 2010b)

One of the main caribou crossings on the Colville River delta. And then what I had never realized what Sara Koonalin (ph) had said was that during the migrations and when it's very hot in the summertime, the caribous like to go along the high banks of the rivers to stay cool when they're in mass amounts. And then I just wanted to point out, and then keep in mind that, you know, that we have to take care of our caribou and stuff like that, and then just wanted to point out that it hasn't been pointed out in a long time, when the caribou start migrating in low areas where there's swamp and stuff and they like to get on high banks when it's really hot and then that they like to travel through

there to try to cool off from the Arctic breeze and stuff. And that's the only thing that I was against, is that pipeline structure is a little too low and I'd like to see it like 10 or 12 feet high because most of our winds are from the east to the west and then, you know, they make -- with that pipeline there, they make an unnatural barrier for the caribous to cross. (Nuiqsut) (BLM 2003b)

In the NPR-A Northwest draft, it says that there will be 150 flights a year. Well, Alpine, the model of a smaller footprint, had 1900 flights from Alpine in the summer of 2001. How was it expected we would not be impacted in a significant way with the subsistence harvest study that showed our village harvested there? They claim that the caribou herd is healthy with numbers, but the only caribou I got last year was bad. Twenty caribou were harvested in October when we could access areas not accessible by boat. Seventeen were sick. When I went camping last year, I waited three days for the herd, to have a helicopter to divert them away from us. When they were diverted, we went without. We have had to deal with harassment. We had overflights three times while trying to cut the harvest. It is disturbing. The next year we had a helicopter do the same thing, but it was worse. They were carrying a sling going from Alpine to Meltwater, another oilfield. It went right over us three times. The herd was right there and it put us at risk. I had my two young sons with me and it made me very angry. What am I to do when the activities that have been handed down for thousands of years to our people are being changed by the global need for energy? (Nuiqsut) (BLM 2003b)

The caribou haven't been coming about the last few years. There seems to be a border of where the caribou want to go. I don't know if they have realized that [they don't want to go to those areas] due to past activity. It has become like that ever since they started seismic explorations, probably five to 10 years. The seismic activity has been moving further west, all over. Every time we go to Umiat we experience exploration. They [oil industry] have been moving further and further west, and the caribou have been moving further and further west. Looks like a mini-town when you see it from a distance. You would find exploration activities but it would be further east, closer to Colville. The next year, it is further west, and that's where you find the end of the caribou. This year, where they last did seismic exploration, that's where you find the caribou. It seems like they've learned the exploration boundary, it seems like they're not crossing them [the boundaries] anymore. (Utqiaġvik) (SRB&A 2013c)

It varies whether we have a lot of activities going on. When there are a lot of activities going on, we hardly see any or they [caribou] change their migration route. Oil and gas, airplanes, helicopters, bird survey people—airplane, floatplanes. Either there are less caribou or they are changing migration with activities. I don't know which. (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

…I feel because of all the traffic between Fairbanks and Endicott, much more increased traffic, that caribou are hesitant to cross the main roads because of all the traffic. I feel that has something to do with the caribou migration as well, because of increased [air] traffic…not just ground, as well as…seismic operations happening all over. (Lampe, 1997, NE NPR-A Scoping, Nuiqsut, USDOI, BLM, 1998) (MMS 2007a)

We will have the same problem we did in the Prudhoe Bay and the Kuparuk area with our caribou. Right now I call our caribou that are existing around here that don't go nowhere our 'industrial dope addict caribou.' They already sick and nobody's doing anything about them. (USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

Caribou displacement. You've heard of the Meltwater and Alpine. The caribou are displaced where they used to go to eat. Instead of caribou, we have vertical supports. If you put up a pipeline, you displace the wildlife. Before Alpine we'd see caribou every summer, every year. They came in the thousands every year. After the pipeline, we don't see them like we used to. We used to catch a lot of caribou from the Porcupine Herd. Not any more. (Nuiqsut active harvester; Experience timeline: 2002 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

The migration of the Eastern Herd that comes through the Colville River has really changed since Alpine with all the pipelines. It's deflected the Teshekpuk Herd from the east and south; because of the pipeline changing their migration route. (Nuiqsut active harvester; Experience timeline: Since 1977 and ongoing; Experience location: Colville River. SRB&A Interview 2007) (SRB&A 2009)

Before they started the [helicopter] activity, the caribou were in the area by the thousands. Now they migrate out and none come in. It is harder to find caribou every year. I grew up hunting caribou from Wainwright. Barrow used to be like Wainwright. The caribou are starting to winter further south. When you reach Wainwright they are everywhere. They are all around Pt Lay. You would always meet the caribou just before October, they were always here. They don't come up from the south anymore. They changed their migration route. From Wainwright they start heading to Barrow but at Peard Bay they turn around and head south. (Barrow active harvester; Experience timeline: since 1996 and ongoing; Experience Location: Alaktak. SRB&A Interview 2007) (SRB&A 2009)

Maybe it's over the last five to six years the caribou routes have dramatically changed since the oil and seismic going on. Like this summer, there were hardly any big herds coming through. You have to go way up for subsistence hunting. You have to go further and further. There were a lot of complaints this summer. All the helicopters flying around. Maybe they're chasing them away. (Atqasuk active harvester; Experience timeline: 2001 and ongoing; Experience location: We go way up. Sometimes 7-12 miles from our cabin. Sometimes we go out by Skull Cliffs. SRB&A Interview 2007) (SRB&A 2009)

Nothing has been done. They say caribou can go under [pipelines], but sometimes they turn back. We mention that to oil companies, to bury the pipeline half a mile away from the coast so caribou can get away from mosquitoes. They say they can go under, but I don't see them go under. Especially along the coast, crossing Sagavanirktok River, then they could go along the coast. (Nuiqsut active harvester. SRB&A Interview 2007) (SRB&A 2009)

Here in Nuiqsut I hardly get any caribou due to the pipeline diverting the caribou. I used to see five to six thousand caribou. I haven't seen a herd like that in years. It's like a rolling thunder when you see that many of them. But they're real sensitive. I don't see that here any more because of the pipeline. (Nuiqsut active harvester; Experience timeline: since 2000 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Because of the pipeline and the choppers and aircrafts that were flying around. When we were way down by the Chandler area and there was air traffic going on over here at Umiat and that red and white plane of Alpine kept following the river and scaring the caribou like he is doing it on purpose. We have bright clothes on and he knew we

were there and he made a couple passes and made the caribou run further inland. That was wrong. Red and white plane. We had the caribou in our sight and plane comes and it took off and turned back around and did the same thing and same path and that [made us angry]. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

You know, what I think about it, since they built that pipeline up, the Porcupine Herd doesn't want to come this way. I think that pipeline is diverting them. Because the Porcupine Herd that's coming in from the east usually travels along the shores. I think they come in from the shore and stay in this area around Beechey Point, because there's no way to go further westward. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

Mostly the caribou used to come from the west, back in the old days before that Alpine there was nothing around, we had caribou coming this way and that way. They mostly came right [through], the whole section of this from the eastern [direction]. Back in the old days, before that activity. Alpine, it started happening since they build that pipeline. Some [caribou] go further north coming in. Especially when they build that pipeline, they really divert that caribou that used to come straight across before Alpine was here. The pipeline's just right over here. All that pipeline goes there and the Western Herd, before the pipeline, they used to go straight there. They really divert that caribou. All those caribou used to come from the eastern herd and go right through. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

There used to be a lot more caribou, but it's getting to be a lot less going to that area. Because they're getting diverted in Meltwater. The pipelines from Meltwater to Kuparuk are so low and they can't cross the pipeline. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

That's where most of the Porcupine Herd usually comes, around here, due to that pad; that pipeline that goes from Alpine to Prudhoe has pretty much changed the route of the caribou migration. The only big herd that usually came around is the Teshekpuk Herd; they came around. None of the Porcupine Herd that usually comes around, they never really came around, [because of] that big pipeline and the pads that connect to Alpine. And that other pipeline that goes all the way to Kuparuk. And from the north pad, CD3, down to Alpine. And then it goes to Kuparuk. It's shiny and makes the caribou not want to go through. Those caribou are scared of the pipeline. Some stick around. Some go towards it and go back. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

It's mostly the pipeline that is affecting the caribou pattern. In the 70s when we first came, there would be 10,000 in a herd but now, due to the pipeline, it affects the people here and they have to go 30 miles out in all directions to hunt for caribou. It's too shiny. The coating is too shiny. More likely…when we were riding on the ice roads one time, we could see quite a few caribou crossing but maybe in the summertime, due to the reflection of the sun, they don't want to cross. They'll pass right under the pipeline [in the winter]. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

Also the pipeline is so reflective that sometimes the caribou thinks that is the edge of the ocean, the ice pack, so that is why they go and travel further south of us. Those pipelines are still shiny, it's not coated. All the way from Alpine, pretty much from CD north, all the way to Alpine, it's so shiny; all the way it looks white. And it's reflecting. We always address that with them, and they say they might change that but they didn't.

That always [is] a problem with their representative that comes to our meetings. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

When a caribou is going to run for safety, they jump six to seven feet and they have their racks on so they have to be able to get underneath the pipeline if they're going to cross freely…when it's running away if the pipeline's too low with its racks it could be running and hit the pipeline and then sheer off its horns and it could cause it permanent or lethal damage to itself. (Anaktuvuk Pass) (BLM 2003c)

And just last week when I was cruising through Prudhoe Bay area like from where the bridge crosses Miluveach and where you start hitting these orange drill sites, pads, and stuff and it just hit my mind that your infrastructure of your pipeline is so low that at times that while you're cruising from that area past that bridge all the way past KOC of Kuparuk that your pipeline is so low that even a caribou wouldn't even attempt to try go over or under, neither. And then your caribou crossing things are so far distance when you look at it, I think I only see three of them. And then on top of that, I just want to point out that the infrastructure like that are for where the pipeline is also they're like permanent unnatural snow fences where the caribou crossings and stuff are, and then that's one of the things that on the environmental side that you all have to be looking out and be aware. And then I really disagree of this five feet pipeline -- five feet high of the structure that you guys are proposing around our land and our area where the caribou migrations and stuff are. (Nuiqsut) (BLM 2003b)

Infrastructure: Atqasuk. When we travel we see roads and I'm pretty sure it makes the caribou go away from our village and closer to Atqasuk. We noticed when we went to get our new snow machine from Barrow. (Wainwright active harvester; Experience timeline: ongoing; Experience location: Barrow to Atqasuk to Wainwright. SRB&A Interview 2007) (SRB&A 2009)

Seems like they're sticking over by the pad, that one. They mainly stay around this area, don't move nowadays. I know that they spend a lot of time over by Alpine. They don't move once they get by over there. I guess just like at Prudhoe Bay. You even see herds go under the building, to cool off.. Because it's cool, there's a draft going under that building. I used to work in Prudhoe Bay for how many years, a technician, for their annual tests to see if there's anything leaching from their pads. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

That CD 5 and 6, that's going to divert my caribou farther south. [During] some winters there's too much air traffic and hardly any caribous come from the west. It's not like back in the old days before the Alpine was there, before the air traffic was there. Yeah, we were camping out and the activities, the caribous used to come over here [from Teshukpuk towards Nuiqsut] They never could come over this year. Mostly with choppers, and airplanes, and the flights to Alpine, that really affects the noise problem. [It affects me] when I'm up there in the summer. [And the] regular plane to Alpine. (SRB&A Nuiqsut Interview April 2010) (SRB&A 2010b)

The caribou migration has been changed rapidly because of the road or too many traffic (sic). Mostly the caribou with the collar don't have enough fat and the meat always taste different. I think if they took the collar off from the caribou I would be satisfied or if I see one I'll kill and leave the collar right there because I won't eat it, too skinny. The problem we got, they put too many collars. And some cows that come through here this fall, I saw two cows with a collar, I think they don't have fat. They were -- probably had

more worms than my dog had worms because of the collar. And besides it hurt the skin. You can see when it moves around right here, it rubs the fur. Gilbert Lincoln. (Utqiaġvik) (BLM 1998a)

And another thing is, the pipelines, they need to be-- they need to have crossways for the caribou because the caribou I think will just follow the pipeline if they don't want to go under. I think that would be very important if they start development around that area. The caribou have to have a place to get down to the ocean in the summertime for --from the -- get away from the mosquitos. I've watched -- as a hunter, I've watched caribou when they're migrating. I've watched them cross my snowmachine trail, they don't have any problem with that. But if I walk across their trail, the caribou will immediately turn back, just from the scent of my feet. I've noticed that, I've watched that as -- just from being a hunter. I think the -- it will really impact my hunting; if the caribou move away from that area, I have to go somewhere else. So I would think that the caribou have to be taken care of, that's my main concern. (Utqiaġvik) (BLM 2004f)

Pipelines; we have seen caribou turn back from pipelines because they [caribou] see a flash from the pipeline. They used to go to Helmericks' in the thousands, not any more. Maybe two or three or less. Especially females with young used to go down there. Westside at Kugaruk, Harrison Bay, there are caribou there. You always see them. We had to go out to the ocean and to Kugaruk to catch them. (Wainwright active harvester; Experience timeline:1999 and is ongoing; Experience location: around Alpine, Meltwater and Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

There is so much activity going on it drives the caribou away from the insect relief areas. This makes them keep running, wearing off fat, not lying down. They want to do seismic testing there in the insect relief areas. This is one of my biggest concerns. (Barrow active harvester; Experience timeline: 2006 and ongoing; Experience location: The southern boundary of the North Slope; the mountain side, central and western parts. SRB&A Interview 2007). (SRB&A 2009)

We're getting to go further and further to catch caribou. Because their route has changed. They're not in our backyard. Now I have to go to other communities' backyards, like Anaktuvuk, Atqasuk and Barrow. Caribou you have to go out further because of seismic testing, helicopters, small aircraft. They'll be flying those choppers again. They'll be doing it soon when they gather information like when the ice goes out or when they haul their contractors out. This scares the caribou. What happens when the belt breaks on your snow machine? I walked 10 hours home once. (Nuiqsut active harvester; Experience timeline: since 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

I've noticed that since they started making ice roads, the caribou are hardly out there anymore. The caribou are 30 to 40 miles out. Some people told me they go 60 miles out. That's the Village of Atqasuk. I called them once to see when there were caribou. (Barrow active harvester. SRB&A Interview 2007) (SRB&A 2009)

It's longer [until the caribou arrive], we have to wait for the caribou to cross the river. Sometimes they don't even cross the river. Yeah, ever since Alpine started, we are having to wait for caribou to cross the river. It seems like they're sticking over by the pad, that one. They mainly stay around this area, don't move nowadays. (SRB&A Nuiqsut Interview March 2009). (SRB&A 2010b)

If I'm able to hunt within 1,000 feet of the pipeline, then it isn't an issue. But a lot of areas between here and Deadhorse, the pipeline is just too low. The snow builds up and they aren't going to put their head down to go under. I saw a caribou blocked just the other day, by Deadhorse. One side of the pipeline is all bare, and the other side is all open land. (SRB&A Nuiqsut Interview March 2009). (SRB&A 2010b)

The caribou that we see at Fish Creek are so far away from the channels, and it's not that easy to harvest caribou and wait for the caribou. And sometimes we have to travel farther west. But a lot of us who go there, we have to wait and a lot of the caribou are diverted by the aircraft. They [aircraft] are counting fish and some caribous that have collars on them. (SRB&A Nuiqsut Interview March 2009). (SRB&A 2010b)

It is hard to say, you see helicopters flying around, you have things going out there that are not usually there, human activity. It is hard to say, with the Meltwater road. With the last couple years the caribou haven't been coming like they used to. I usually catch 20, 30 caribou for my mom and other people. [I have been harvesting] way less than usual. (SRB&A Nuiqsut Interview April 2009). (SRB&A 2010b)

The Prudhoe Bay spine road is like a gate: the caribou get corralled in the area by roads, traffic, pipeline reflections, and staging. They get confused. They are scared to cross the pipelines, they are as scary as a grizzly bear would be to the animals. Some caribou are driven south, others are driven to the coast. If more roads are built, then there will be more blockage of the caribou. They will get stuck in the oil fields like a corral. The ones stuck south stay south and get little insect relief, while those going north get to the beach and the coast and get relief (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004). (Nuiqsut) (MMS 2007a)

I think the pipeline in a big factor in the caribou migration being disturbed. Because when I first came to Nuiqsut in 1993, we would be at Nanuq downriver and the caribou would come straight across – Fish Creek, hundreds of caribou – and then the pipeline came and…. And that year – 1993 – I got 10 fat bulls in July. We got a whole bunch of caribou right about where they put that pipeline. After the pipeline the caribou don't go through there anymore. They either go, their route changed, go through Fish Creek and come this way. The pipeline definitely changed their route. (Nuiqsut) (SRB&A 2015)

Pipeline height is always an issue. Five feet minimum is inadequate. I mean you hear so much. You hear that it's a concern to the community. And the coating of the pipe, the outside layer, you know, it's just like a reflection especially during the summer hot months. I mean you could see that, you know, the pipe having reflection. I think they should put better, you know, coating or something that wouldn't reflect. I think that's where the problem -- maybe -- I don't know. Maybe that's one of the issues that needs to be addressed, that it's deferring the caribou. I mean there's some studies, I think, that needs to be done. (Nuiqsut) (BLM 2003b)

The pipelines, you know, maybe the caribous don't like to go through the pipeline even if they can go through, they hardly don't' do that anymore; they always have to go around somewhere. They always start to go up river and then up around Fish Creek. We can see tracks down by Ocean Point and then going up towards Fish Creek [circle around south and then back north toward Fish Creek]. There used to be big herds going through there almost every year. We would have lots of caribou in my area [before], they go by my house; bunch of caribou would be hanging around in that area and go

over towards Fish Creek. Those pipelines, some of them are not too high, and some of them there are places for them to go through alright, but they always be scared or something, I don't know. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

With the five foot proposed pipeline height, it's a big concern to me. As you are aware of the studies that were done on this was for caribou during the summertimes and, as we all know, it snows during the winter and the snow drifts and builds up. It's a different case during the wintertime where caribou may have problems crossing pipeline during the winter months. So I would recommend a minimum height of seven foot instead of the five foot minimum. (Utqiaġvik) (BLM 2003a)

In addition to this 13-mile pipeline I'm talking about, with the new discoveries that already occurred south of the Kuparuk field, we have about another over 10-mile pipeline again, that that's three feet high. And then you look at the caribous when they - when they're trying to get to the ocean side, they're always migrating, keeping away from these bugs and everything. They stop right at Oliktok. They - we don't see those anymore, these thousands of migrating caribous. Now, at the same time, we're seeing hundreds. (Utqiaġvik) (MMS 2001a)

Look at Nuiqsut. Couple years ago they were finally able to catch caribou around their town because -- three years ago there was seismic being done around Teshekpuk Lake, and what they did was take that herd around Teshekpuk that used to come here to Barrow to feed us, they chased it all the way over to Nuiqsut. And that winter we caught nothing here. We had -- our hunters had to go above Atqasuk, above Wainwright to find caribous for themselves. You are talking traveling from 60 to 100 miles just to find something to feed your family. Did we get any assistance from anybody? Heck, no. And the federal government couldn't lease it fast enough. (Utqiaġvik) (MMS 2009a)

Seems like they're sticking over by the pad, that one. They mainly stay around this area, don't move nowadays. I know that they spend a lot of time over by Alpine. They don't move once they get by over there. I guess just like at Prudhoe Bay. You even see herds go under the building, to cool off. Because it's cool, there's a draft going under that building. I used to work in Prudhoe Bay for how many years, a technician, for their annual tests to see if there's anything leaching from their pads. (Nuiqsut) (SRB&A 2010b)

Actually, with the Meltwater road on there, the caribou are getting lost. They don't' know where the migration route is. We've got the Prudhoe roads over there, but the Meltwater comes farther down, and in the caribou's mind, where's the direction? We used to have the caribou coming into town, the migratory route [used to] come in, but now they don't do that anymore. (Nuiqsut) (SRB&A 2013b)

That migration pattern has gone southward. We hardly see the western herd this year. The Porcupine Herd, haven't seen them lately. We used to see thousands of Porcupine Herd coming through the villages, but we haven't seen those for a number of years and since that pipeline was built, that changed the pattern of the migration of the caribou. [We are] mostly harvesting caribou from Western or Central Herd. (Nuiqsut) (SRB&A 2014a)

Pipelines; we have seen caribou turn back from pipelines because they [caribou] see a flash from the pipeline. They used to go to Helmericks' in the thousands, not any more. Maybe two or three or less. Especially females with young used to go down there.

Westside at Kugaruk, Harrison Bay, there are caribou there. You always see them. We had to go out to the ocean and to Kugaruk to catch them. (Wainwright) (SRB&A 2009)

I don't think that has changed much, except we used to get the Porcupine Herd, but no more. After the pipeline, we don't see them anymore. (Anaktuvuk Pass) (SRB&A Unpublished-a)

There has been some adjustment time for the caribou from the Alaska pipeline, the oil pipeline. And I think they have adapted to that pipeline now. So this project might not have as much affect because it's along the one that's there. The road to Umiat will definitely affect the route of the migration, but that's another study. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Any activity that goes from north to south, [the elders] made the statement, north to south activity is not too harmful. It's not affecting the migration of the caribou that go north and south. They travel north and south, so that north to south activity doesn't have much of an effect on the migration of the caribou. So that's not a concern, and it's already going through completed project before. (Anaktuvuk Pass) (SRB&A Unpublished-a)

We live on caribou. I don't know what they changed, the haul road or who knows what now. [after road and pipeline we are] hardly catching caribou [in the] fall time. The [proposed road to Ambler], that's gonna make it worse. Cause that'd be in the winter [that it would be used for construction]. DOT [will] make an ice road, snow road. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Maybe on the seismic – it's always the most distracting, because there's a lot of wires, and you are crossing [over] wires. When they do the seismic, the caribou seem farther out. Even in wintertime, when we see lots of seismic activities going on. You could see it right there, just laying on the ground in the land area. They're bright orange and you can see them for miles and miles. (Nuiqsut) (SRB&A 2015)

Pretty much the caribou herd, what they always talk about. The migration route is a big concern to all of that. As long as I have been here we used to get the caribou herd run through town. When I was little. IT's been about 10-15 years or something. Since they actually came through town. They actually come into town, the caribou trails. You can see them come into town. And then there is a couple more, and on top of that hill around here, that hill has a caribou trail that has always been there and everything. (Nuiqsut) (SRB&A Unpublished-b)

Nigliq seems a little wider. The caribou don't really go. They used to go further into the pipeline and now they split into little groups. I remember when there used to be thousands. (Nuiqsut) (SRB&A Unpublished-b)

One of the concerns I have, I was about 13 years old when the porcupine caribou came through town. I don't see tutu come through town anymore. There are trails that are old caribou trails, they used to run strait through town but that was before Alpine. They go around now and stay away from the community. (Nuiqsut) (SRB&A Unpublished-b)

Yea, they will divert the migrations when they are in the middle of their construction because they will not stop for caribou pass by. The caribou were already affected by the TAPs. When those drill sites expanded that is when the caribou were diverted. They

were diverted eastwards instead of going through the village. The development is going to be a concern to the wildlife. It will actually be more difficult to go further to harvest caribou. If they open that Umiat road what will happen to Anaktuvuk Pass and Nuiqsut? They will cut off our access to the Central and Porcupine caribou herd. That is going to be an issue when they build this. How are the wildlife, and the caribou, be address under that APP project? (Nuiqsut) (SRB&A Unpublished-b)

Undoubtedly for good the animals need a sanctuary. I have always joked and said that since I have worked the oil field for several years. Before that the closest I could get to a caribou was maybe 500 yards, but in the oil field you can get a whole heck of a lot closer. They know it is safe. (Nuiqsut) (SRB&A Unpublished-b)

Moose

The wolves are a major impact on the moose population. There has been industrial activity that takes place there more recently. I don't know if that's affecting the moose or not. You theorize activities there in winter time, it's so cold there, that any additional movement or pushing of the animals has an impact on their ability to survive the winter. They're using their fat reserves. Additional activity is going to burn that off quicker. One year they found a couple animals off the Umiat runway, they had pneumonia, a cow and a calf. If you run animals hard in the winter time you can frost their lungs. This is just my opinion, but the wolves probably pushed them hard enough to where that happened. (Utqiaġvik) (SRB&A 2013c)

And some people always run into moose that are – they say that some moose have a big lump on the side of their bodies and they don't really know what are causing the bumps in that area. We have learned back in the 1980s that there was a lot of seepage of battery acid from the Umiat site…. Maybe from the battery acid from that Umiat site. (Nuiqsut) (SRB&A 2013c)

There's two places that I know where there's always a lot of moose. Right by our camp [at Sentinel Hill] on the east side mainly, the majority of them. One year we saw maybe five to six calves in there. Two cows had calves. Then by the Uluksrak [Bluff]. The high country is on the west side, so we could go up there and then scan the area from the west side and look at the east side [for moose]. (Nuiqsut) (SRB&A 2013c)

Basically on the Colville, between Anaktuvuk Pass and 20 miles up from Umiat is where you find the most concentration. They usually tend to gather around Umiat area, in about a 10 mile radius of Umiat, but basically on the river. That's where you find the bulk of the moose herd. It's always been like that due to probably the highest concentration of willows in that area. (Utqiaġvik) (SRB&A 2013c)

Well, the first time they declined there were high incidence of brucellosis and leptospirosis. We thought that contributed to the decline. This time we're testing them, they don't seem to have their disease. They're dying of pneumonia, which is usually secondary to other diseases. We're in the midst of doing range studies there. The population isn't really high, but we're finding moose that starve to death. We sampled the willows and there was plenty of browse. Now we're sampling the quality. They're way up on the ragged edge of where moose ought to be. Maybe the plants don't pick up nutrients the moose need. And, to keep things more complicated, the snowshoe hares just moved into the area in the early '90s, before it didn't have rabbits. Just as the hares came in, the moose population fell. One thing that can happen with willows is if they're

being preyed upon heavily, they'll start producing toxins that make them less digestible. (Utqiaġvik) (SRB&A 2013c)

Small Mammals

It should also be known that leasing in the Colville River Special Area, this oasis is a riparian habitat is very productive and supports wildlife populations such as moose, hares, lynx, that are not abundant on the rest of the North Slope. It's an important area were North Slope people can harvest meat and fur trapping, conduct fur trapping. (Nuiqsut) (BLM 2019e).

They're basically in the Umiat area, that's where you tend to see the most concentration of rabbits is Umiat area. Probably about same as moose, where the willows are the thickest. Up the Chandler and up the Anaktuvuk River, but more in the main river. I think they're about ready to crash. I don't know how many year cycle they have, but it's getting close. (Utqiaġvik) (SRB&A 2013c)

Trapping was abundant east of here. Now, we don't go over because of the oil field. Just recently, it is known that the foxes are very dirty, discolored and rabid in that area. Trapping is done elsewhere. We used to see grizzly bears around. Now, they are not around. Where's the caribou now? One summer when we used to walk miles looking for caribou, we came across two dead caribou for unknown reasons. The animals have faced a change. We have faced a change since activity began. If there is to be further activity, the fish and the sea mammals will suffer and we will suffer too. We depend on the fish, wildlife and the birds, still, today. Bessie Ericklok. (Nuiqsut) (MMS 1979b)

You don't see lynx anymore, at least up there. There were hardly any to begin with but my grandpa would get them all the time. I don't know why they aren't really around anymore. You just don't see them. (Nuiqsut) (SRB&A Unpublished-b)

Also there have been porcupines this far north. Camp robbers [birds] or chickadees are up here until January. (Nuiqsut) (SRB&A Unpublished-b)

3.3.7 Marine Mammals

Distribution of Marine Mammals in Nearshore Environment

Seals

When the river floods, near the mouth of Nigliq river it becomes filled with a hole or thin spot in sea ice that has melted as the river breaks up. When it reaches the sea that is the time that they begin to hunt for seals, through that thin spot in the sea ice that has melted. They hunt for bearded seals and other types of seals. (Nuiqsut) (BLM 1998c)

About a quarter mile off here, the brown water and the green water off of the shore. Off of the coast. [It looks] like there's already a line right there [on the map]. That color, that brown water and green. And then at the end of June those seals kind of eat on the outside of the brown water for some reason. I don't know why but maybe it's that muddy taste. I'd rather wait until the lagoon clears up and then start getting fish. Dirty water – the fish don't taste that good. They (seals) are on the green side of the water. (Point Lay) (SRB&A 2011a)

I know the ugruk season was kind of slow because the river water was kind of murky and as soon as it cleared up, they started showing up. I just got one. I think I was the only one that harvested one in June, and then the ice went out all of a sudden. It is every year [that the water is murky] and you don't see them until it clears up. You only have like a two week window for hunting ugruks and seals. (Point Lay) (SRB&A 2013a)

Utukok Pass. They go feed there for herring I think. That is a special place, there is like 50, 60 [seals] around there. I have never really seen them on the passes south of Five-Mile [Kukpowruk Pass]; I see them on Five-Mile Pass, Eleven-Mile [Akunik] Pass, Utukok Pass. The pups stay in the pass. All along the spit the pups are down there. There is quite a few of them. (Point Lay) (SRB&A 2014b)

Hardly any [bearded seals]. It seems like if we're not catching them, something's happening. I used to see lots of bearded seals on the ice but this year, like I said, I saw a pod of 100 seals on the ice but this year I didn't see that number. I saw like half of that number, maybe 30 when it should have been 100. I almost want to say this is my theory, because of our climate changing and the ice getting rotten farther, the seals have more of a chance of swimming away from the areas. When they have good ice these animals can't swim away. They have to stay in the area and keep that ice open. They have the freedom to go anywhere now. There's more rotten ice. (Point Lay) (SRB&A 2013a)

Well, the seals have been coming onshore onto the land more frequently than previous years. I think it's because of our ice. It hasn't been there. Same thing with the walruses too. They've been onshore here for almost a month now. I think they go out and feed and then come back to shore because there's no ice for them. Yeah, I guess our northern ice cap has been melting so all the ice that does form over the winter is mostly first year ice which melts over the summer. That's been the case here the last few years with our walruses and seals. They come to shore here near town because there's no ice for them to rest on. (Point Lay) (SRB&A 2013a)

It's earlier than usual. First of June we get that breakup, end of May. That was the weirdest point of the season. It goes right away, it don't stay anymore. We used to get that ice first two weeks of July but end of June is when the ice is going out. We used to hunt bearded seals. Nowadays we're lucky [to harvest a bearded seal]. Lot of animals like to stay up where the ice is. (Point Lay) (SRB&A 2011a)

Walrus

Point Lay seems to be a good habitat for walrus, lately! It's typical, but we've been seeing big haul-outs. We're seeing 1,000 [count] haul-outs. Right out here on the first point I was talking about. It seems to me like they've been hauling out right there for the last three or four years in the thousands. I see like 800 or more. Uh-huh, there's lots of haul-outs all the way to Icy Cape right now, a hundred, fifty, but for some reason they want to stop right here. Icy Cape would be another big group of haul-outs. They gather up there, right on the point. (Point Lay) (SRB&A 2011a)

We live on the mainland, but we have Kasegaluk Lagoon, which is an 80-mile stretch of lagoon that goes from the foothills down south about 30 miles from our village all the way up to near Wainwright, which is considered the longest lagoon in the world. And there are 11 inlets. And every year we have birds migrating from down south coming up and utilize that lagoon. The walrus use that lagoon to get out of storms that

happen in the ocean because I've witnessed it quite a few times during my 40 years. The belugas go in there and, you know, as well as, you know, ducks, geese. We have a wide variety of waterfowl that utilize that lagoon. (Utqiaġvik) (BOEM and BSEE 2013)

Walrus are hauling out more and more in the fall. The ice is changing. During the fall time the ice is way too far for the walrus. They go haul out on the shore. They picked our barrier islands to do that. About the first of September, they start doing that. That's when the Fish and Wildlife do the walrus tagging with the crossbow. They say there's a lot of clams out there. They wanted one of us hunters to get one, just to see what they're eating. And they are full of clams. Sometimes there's a few… this one year they found 30 dead walruses out there that just beached and died with a lot of sores on their face and bodies. But these last two years, I never saw anything like that yet. (Point Lay) (Wolfe 2013)

That, you got it right there. Yeah, we do sometimes occasionally go past Cape Sabine. This is where we get the walrus over here…. Walrus , you'll see them here and there [adding a small use area to the existing one], maybe just a mile from shore. (Point Lay) (SRB&A 2011a)

Polar Bear

Now we see they use the islands and banks a lot more now. Even when ice floes are big enough to use, it is the time of the year when there is a lot of snow during November, December, and that is when we see a lot of snow come around. Even if the snow is not dropping, it is drifting. That snow is drifting into areas where they have to put a den. You could see hardly any snow in one area when you go outside, but snow has accumulated enough for use. We see a lot of that happening now. By March they know where to go when they come out of their dens. (SRB&A Utqiaġvik Workshop, January 2018) (Braund et al. 2018)

He indicates there are more bears starting to den using the land. Some bears are denning in low, flat areas where snow can build over time in that area. They are starting to look for other places to den other than mostly the ice. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

When the young ice that we call siguliaq is older, young ice that has gotten thick over time, and it starts to ridge and it gets long and go for quite a ways. A lot of ringed and bearded seals look for that kind of condition so they can live in there year round. There is enough snow for a lair, so they do not have to move away so much. The bears are looking for that type of ice to hunt in. The puktaagruaq are large multi-year or large chunks of ridged up ice. Icebergs. Puktaaq. Single large piece of heavy ice. Bears like that area too. They like to be on the thin stuff too. Siguliaq [thin ice]. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

Generally, bears start coming from the east when the lagoons are freezing. In September and October they come from north with ice then they get on the ice with the beach. In the winter time, with the west wind, they come onto the shore fast ice. In the spring time, they know where to go; they know it is whaling season and know they will have food to eat. You see that pattern with almost all of the whaling villages; they know how to learn when it is time to go whaling and go to those places. The seals are moving too with the seasonal migration happening and belugas and walruses with the floating

ice. The timing is important for animals migrating and with those migrations are going to be the predators (SRB&A Utqiaġvik Workshop, January 2018) (Braund et al. 2018)

When a polar bear is really hungry it does not matter how big or small it is. When there is that factor the bear will not stop. There is that source of seal skins, rendered oil or food in the community. It has been like that for many, many generations that he has seen and these communities know that when an animal is starving when he smell something, he will not stop at a gun or person or dog. He will be determined to get that source of food. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

Participant 1: You have to scare them so they will not come back; not just shoo them away. You scare them. Gun shots and shoot near them on the ice if not going to take them. It reduces them coming back.
Participant 2: Chase them out with snowmachine. I think we need to chase them farther rather than just a little bit out of town so they will not come back.
Participant 3: When they first come around, you shoo them away, but they go out and you think they not going to come back. When they do come back, the bear hunter will chase the bear out until it knows [Name] that it is not welcome in the town. Chase him really hard. Chase him until the point they are tired, and that will reduce that bears chance of coming back. It knows it will get tired. That has been taught to whalers and community members. That sort of action. It is in our bear patrol. We try to teach the same kind of tactics that were used through generations. We put that part in our bear deterrent program.
Participant 1: Cracker shells and bean bags.
Participant 3: Hard chasing been around a long, long time. (SRB&A Wainwright Workshop, January 2018) (Braund et al. 2018)

I would like to mention our polar bear as well. I know that I didn't mention them. Lupita for the record. I know that there is polar bear calving. The polar bears do come up into our mountains and they calve up here. Be aware that they are calving. I know that there's special consideration for our polar bear right now, especially with that new treaty that's being issued so there's some protection for our polar bears that Fish and Wildlife already put into place in some of these areas so I would like to make mention of that to take a look at that. That way when we, when we come back with another scoping you have a projected map with those markings on there. That way we could see it because I mean it does say River Uplands Special Area but it doesn't really say what it's protecting, why it's protecting… (Point Lay) (BLM 2019b)

[Point Lay resident] will attest that they'll den close to the old village. And you can find polar bears almost anywhere. All they need is a snow drift to den in and they do. We'll find them along the barrier island. They're not in the numbers that you might see in Kaktovik and Point Hope. (Point Lay) (SRB&A 2011a)

She said they have lived subsistence living as their forefathers did also. They traveled with animals. They survived on animals. And she stated that once…the polar bears, they live on ice, but the females, when they tend to their young, they don't live on ice. They go towards the land and the rivers. Go towards the rivers to tend to their young. The fish travel towards land when there's no ice, when it's easier. And then they out out to the ocean when it starts freezing up. And she states that animals know fish go towards ocean underneath the ice. Sarah Kunaknana through translator. (Nuiqsut) (MMS 1979b)

Whales

In the past we have -- we have seen a lot of ice making it difficult for us to go out to the main open water. Now you don't see that. In recent years, once the ice goes out, you don't see it. It don't come back. Now that will change the pattern of the migration of bowhead whales. They will be traveling closer to the shore, closer to these barrier islands in the 30-meter mark, and that's where these marine vessels like to travel from. And that has been their pattern since the ice pack had gone further north, 100, 200 miles north of us. And since then, all these bowhead whales have been traveling a lot closer, and some are traveling inside the islands. And now they migrate -- they use these islands as more of, like ice because they are shallow. Thirty-meter mark is real shallow. And if we cannot -- like Archie Ahkiviana said, we had a successful season in the past couple years because the whales were closer to the islands and we did not have to go further out, no more than eight miles out to -- to catch our harvest. And a lot of times we may be weathered in because of the weather, high seas. Edward Nukapigak. (Nuiqsut) (MMS 2009b)

Seventy-five percent of our food comes from the ocean. We get some of our food from the land, but the ocean is our garden. Whales, beluga, walrus and seals are all foods we need. OCS is something people are concerned about because it can contaminate our garden. We know about Prudhoe Bay. The tundra is fragile and if you scar it, then it will last for years. We have seen that with oil development. But, if you spill oil in our garden, the scar will be forever. (Utqiaġvik) (EDAW Inc. et al. 2008)

[We hunt in] June, July, but it has been earlier these past few years; it used to be July but you can say June now. All the animals come early, even the bowhead. They used to hunt them in May and now they do it in April. Animals don't have a calendar. Maybe it is the climate that lets them move back and forth. Whales have been coming earlier. (Point Lay) (SRB&A 2014b)

If we don't have any down there [Cape Sabine], we'll come up and scout around there. We've herded them more down there more often than we've herded them from up north. We go out here, and then we go this way [toward shore]. We don't want to cut them off and scare them back to where they're so far away and we have to wait…it's safe to say five miles [offshore is the furthest they go when beluga hunting]. I think we've gone as far as Eleven-Mile [Akunik Pass] to turn them around. Those are reference points, so you might go a little further than that…[you go to] whatever inlet you're nearby. You can lose the beluga real quick out there. You herd them in through the closest inlet. (Point Lay) (SRB&A 2014b)

Health and Quality

The bearded seals used to be fatter. They're not fat at all. They travel more, we hardly see them, that's why there's a short time [when they are] around. I bet that's the problem with the beluga, too. They're not as big as [they were] a long time ago. (Point Lay) (SRB&A 2011a)

A lot of sick seals, [ringed seal]. Couple of bearded seals me and my crew got their hair wasn't all there. They were already molted, the big ones anyway. I found maybe five or six eider ducks dead. [More than usual]. It was, I think it's the heat. Yeah. There's a lot of sick walruses, seals, a few I saw bearded seals, ducks, eider ducks. From Eleven-Mile north that's where I saw most of the sick animals. (Point Lay) (SRB&A 2013a)

I have been butchering seals for more than 20 years now. I can safely say in the last five years I have had six seals uneatable, unusable to where I had to just throw them out, throw them back into the ocean. One of the -- I did have them tested, and it did come back malignant with cancer. So another thing to be watching out for, too, for these ships that are going is the waste that they are putting in the waters because it is affectic -- it is affecting all these -- the bearded seal, we hunt that for kiniqtug and misigaq. And that's one of the things that is important, too for our well-being. Take a teaspoon of misigaq, and that's better than Dimetapp. It really is. You know, you -- it may sound funny, but -- beluga oil, you rub it on your chest for a chest cold. We use it more for than just food. Roberta Leavitt (Utqiaġvik) (MMS 2007b)

Climate Change

Animals were only available during very narrow opportunities because of the weather, the sea state conditions, and the early warming. We not only lost our ocean ice early, we also lost all our beach cover early as well as [losing] all the ice in the inlets early. [There was] no way to really go any farther than 20 miles without dragging a boat with you. But yet the lagoon ice was very thick and did not go out until the middle of July so we couldn't use the boat ramp to launch our heavy boats. All the weather conditions worked against us. We have to adapt to it; it's normal. (Wainwright) (SRB&A 2013a)

If you look at everybody else's data, there's a one week period in August that everyone got bearded seals. That was it; that's not normal. We usually get them all the time. It's because there's no ice; it was all blown out to sea. Not having no ice. We had no ice, open water for about 200 miles all summer long. It was pretty hard to use the ocean because it was too dangerous. There was that one week period that they had gotten those seals. After that, nothing. When that opening happened I wasn't home so my boat didn't even go out in the ocean. (Wainwright) SRB&A 2013 (SRB&A 2013a)

The seals typically come the middle of June, and we're here, we're waiting, people are struggling to get their boats launched because of the soft sand and there's no seals. Wide open water. The conditions were a little choppy, and then one day toward the end of June about the same time I started getting hits on the fish finder then the seals come, and we had—it was an amazing hunting window. Almost two weeks of perfect weather. (Wainwright) (SRB&A 2013a)

The ice conditions; I noticed the ice isn't thick as it used to be 10 years ago, 15 years ago. Even last year, too, wasn't as thick as we'd like to see it. They're probably going further north just to find good hunting grounds because there's hardly any ice. (Point Lay) (SRB&A 2014b)

I've noticed that the shorefast ice has come closer and the lead opens up closer than it used to when I first moved down here. I went out seal hunting one time and my speedometer said 15 miles and I just looked down, and I said 'Hey boys, we're going back; this is way too far for me.' We didn't even reach it [the lead]; we had two miles to go. Nowadays, it opens up two to three miles out…. I think it made it easier for our subsistence activities to have an open lead closer. We would have to go north, you know, to find closer open leads. (Point Lay) (SRB&A 2011a)

Effects of Development on Marine Mammals

> *...there are other persistent organic pollutants that are concentrating in our animals. There are studies of the polar bears that are showing these concerns. These pollutions from industry developed elsewhere are coming to our lands with the way the air currents are and the precipitation, they are coming to our lands and we did not have to identify the issues, but we have to deal with it. This adds to what is coming from the fields of Prudhoe Bay, Alpine, and Kuparuk. There are changes to the animals which are our resources for survival, the fish, the caribou, the whale, and others.* (Nuiqsut) (BLM 2003b)

> *People that use the ice road leave trash, and animals eat that trash. Caribou and polar bears—have trash inside of them. Seals—plastic pop rings. Within the last 5 years, on the ice road, [I] see a lot of trash all over* (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004). (Nuiqsut) (MMS 2007a)

3.4 SOCIAL SYSTEMS

3.4.1 Landownership and Uses

See traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES section for traditional knowledge that is also applicable to this section.

> *On the issue of the Haul Road. The direct environmental impacts of the pipeline has been limited and manageable. Issues associated with the Dalton Highways or the Haul Road and their relationship to the pipeline issues complicate matters. Clearly, the Haul Road and the pipeline are related and the management of the two assets must be a coordinated undertaking. The State of Alaska, over the strong objections of the North Slope Borough opened the Haul Road to public traffic. The ongoing and potentially serious impacts associated with the Haul Road must be considered together with the pipeline for purposes of impact assessment. Originally a restricted industrial supply route to the oil fields, the Haul Road is promoted in a lot of travel magazines as one of the America's great frontier driving experiences. This attracts more and more travelers every year to a road that was not designed for public use and is not adequately maintained for public travel. There is a critical shortage of sanitary waste, emergency facilities, including toilets, waste receptacles, roadside pullouts and call boxes. Drivers of 18-wheelers feel they have a priority on that road, just drive it one time and you'll see it, as was the intention and the case since the highway was first constructed. Slow-moving or stranded passengers vehicles can create dangerous situations out there. It is, of course, the North Slope Borough which must respond to emergencies on that very road within our boundaries. This is an added expense to us, to our local government and diverts limited response equipment and personnel from potential needs in our communities. George Ahmaogak, Sr.* (Utqiaġvik) (BLM 2002).

> *The eastern bank of the Colville River is virtually not a subsistence area anymore. And that's probably -- you know, if your research people look at that, that's an overwhelming fact that it has happened. Although, in the comprehensive planning in Prudhoe Bay, the industry, State of Alaska had assured us that they would not restrict hunting, they have barred and restricted hunting from the eastern bank of the Colville River to the Sagavanirktok River already.* (Utqiaġvik) (BLM 2004f)

> *My major concern is access to areas we've been using that may be developed and possibly we'll be prohibited from going in there. That's a major thing I've seen with*

what's happened in Prudhoe bay and the Kuparuk area. You go through Deadhorse to Barrow and a number of times I've been denied the ability to go off the road system. A snow machine on the road is a bad idea. I went from Deadhorse to Aluktak and had to hire a trailer and truck to carry my snow machine. (Barrow active harvester; Experience timeline: 1995 and ongoing; Experience location: Prudhoe Bay, Deadhorse, Aluktak. SRB&A Interview 2007) (SRB&A 2009)

All the western side of the Colville River and the rivers that they used to harvest game, to harvest fish, waterfowl and to use as camping areas because traditionally, these areas have been used by their forefathers. They continue to try and do this but what do they do? They are blocked completely by the industry. Even though that it's written, it's black and white on paper, Native people could subside in these areas, you try and do that, you get jailed. (Nuiqsut) (BLM 1998c)

3.4.2 Cultural Resources

We have not been able to have access to our traditional hunting grounds that we were raised with…The Inupiat have a close relationship with the land and animals. It changed the spiritual need between the Inupiat people and their traditional hunting grounds because they had a very close relationship between land and animals. Jonah Leavitt. (Utqiaġvik) (Worl and Smythe 1986)

To understand our culture is to understand the correlations of history, archaeology, socio economic factors, land and wildlife factors to a livelihood of subsistence patterns of the Inupiat people. The relationships of history and culture cannot be separated. The same is true for subsistence resources and the human food web process, including organisms of the smallest regime. The total regime of sea mammals, fish, land animals, birds, and caribou is all interrelated and dependent upon each other. To destroy one small part of the regime is to endanger the other parts. One begins to wonder if the hierarchy of State and Federal Governments understand these inter relationships of the total ecosystem as a whole. The total ecosystem provides the network for the continuation of a subsistence lifestyle. Flossie Hopson. (Utqiaġvik) (MMS 1979a)

Cultural resources along the Beaufort Sea coast are not defined in terms of architecture or buildings alone. Beyond such static material categories is a whole panoply of dynamic resources. Spiritual associations with places and activities shared by local residents, subsistence hunting, fishing and gathering pursuits. John Carnahan (Utqiaġvik) (MMS 1979a)

Cully Hill is the original graveyard for Point Lay, and we started another one by the freshwater lake. There's been people lost up and down the rivers and you occasionally find skulls. These are old war grounds. You'll find places where they made spearheads. This is where Point Hope and Barrow used to fight. You'll read a lot about the war grounds. Kukpowruk, at the base of Igloo Mountain, there's a lot of stones there. One story, that [a local resident's] parents told was that they were taking dog team down there and suddenly it started snowing red, and that sounds like fallout to me. These are two well-seasoned travelers. You have to wonder what was going on….There's a couple of sod houses at Kuchiak, just south of the mouth. Every river is significant. Pigmiaq River, at one time when Point Lay had only one man here, he was born at the mouth of Pigmiaq River, and there's sod houses there. Just south of it. And the coastline is encroaching, so at some point those are going to erode away. Cape Sabine, we used to

go there all the time. When Point Lay was unemployed, Cape Sabine was a common place for people to go there. (Point Lay) (SRB&A 2014b)

The old village, right across [from the community]. Where the plane is on the landing strip [on the map]. We have old sod houses and graves. The second one is across the river. We lived on an island. That [on the river] used to be the second village. [The first village] was an island. The houses were lined up. All the houses would get buried. This is the third site. (Point Lay) (SRB&A 2014b)

So, I know that this area right here like Jane was saying, the Kasegaluk Special Area that is protected right here, well there's the Tuniluk River right here and there's the Tuniluk Lake and these are all historical spots where our people were, a large amount of our people and it's in our record. So, I just want to point that out that I would like to have this site right here protected. (Point Lay) (BLM 2019d)

The main one is up here [at Icy Cape]. There is a well-known Native village there. I want to see it [designated] as a historic site. One time my dad would say there used to be a thousand people there. (Point Lay) (SRB&A 2014b)

I'd just like to emphasize the importance of the Chipp, Ikpikpuk and the Colville River areas historically and still today. (Utqiaġvik) (BLM 1997b)

My mother is from Oliktok. When they were developing Alpine, the "rollagon" almost stepped on my mother's sister's grave: the industry never apologized to her. That would be my strongest point. (Barrow active harvester; Experience timeline: 1999; Experience location: Oliktok area by the mouth of the Colville River. SRB&A Interview 2007) (SRB&A 2009)

The Haul Road was built right over my grandfather's mother's grave. My father brought up the concern. The answer was given as "It was the other company's fault." Gravesites and campsites should be documented. No mitigation was done. It might not have been the only grave there. (Barrow active harvester; Experience timeline: 1976; Experience location: Dalton Haul Road. SRB&A Interview 2007) (SRB&A 2009*)*

Narrow view of sites. We got grave markers and burials. In the winter we have markers, but they're buried by snow. You get oil companies driving all over the area. That's not right to do. We are Iñupiat. We respect our elders. (Barrow active harvester. SRB&A Interview 2007) (SRB&A 2009)

We went seal hunting during May and in June, before breakup, we had to land again. The islands are used heavily for nesting and molting ducks, geese and pintails. The islands are important and have historical and cultural significance. There are whale bones and old ruins at Pingkok Island. The lands and its wildlife, fish, have changed today. For example, Putu used to have a free flowing channel. Now, last year, it had to be physically channeled. Two years ago, my brother Paul went to fish at Itkillikpaat where he ordinarily fished. He came back with no fish. We used to catch fish anytime we put a hook in. The Itkillik River is now rusty colored. There are even a bridge at Puviksuk. This river used to be glassy clear, as I have known it. These are the effects of past activity. Bessie Ericklok. (Nuiqsut) (MMS 1979b)

Our family stayed at Prudhoe Bay until the late 1930's. Our old sod house is still standing today. When I visited last summer, I saw the pingos we used for duck blinds was a burning pit. Our place is a barge landing place instead of a fishing camp site. I

guess people that are aware of Prudhoe Bay know that old shack on the east dock. That's where her house is still in position. That's the one she's talking about. There are a lot of old sites, camping sites, fishing sites along the coast line. The are there and are being threatened by development. Sarah Kunaknana. (Nuiqsut) (MMS 1979b)

The oil companies travel doing seismic and surveys outside right now with snow vehicles. They should watch what they are doing. They don't know what they are stepping on. There are some graves out there they are running over. I see a lot like that. There is a graveyard southwest maybe 20 miles from here and some survey people don't care what they are doing. Do they have a monitor? Do they hear what Native people say, not to step on or run over [a grave] - a dead person might be under it. Don't just ignore the stakeholders. Watch what you are doing. There is a graveyard out there. It was there before you were there. They did not dig down far in permafrost. Not just one graveyard out there, there are more. (Nuiqsut active harvester; Experience timeline: 1999; Experience location: Fish Creek; Judy Creek. SRB&A Interview 2007) (SRB&A 2009)

They are still recognizable if you know what you are looking for. I think it was AARCO at the time who contracted an archaeologist on west side of the Colville. Settlements about 3-400 years old over there. Still some remains there that people were living there. He was showing me the old bones with cut marks, the fire pits, the sod depressions. I would say that happened within a decade. When HDE was first coming on before the project. It was either AARCO or the state or both that contracted him to look for sites on both sides of the river. And he has found several more not just in the crossing but going east. (Nuiqsut) (SRB&A Unpublished-b)

There are a lot of unmarked trails up there. A lot of history actually. A long time ago before development when they were living in sod houses and dancing there was a lot of trade in caribou and muktuk. That is how they would do it. They would do a lot of trading in the winter and do a lot of hunting in the summer time. (Nuiqsut) (SRB&A Unpublished-b)

Not so much on the ocean coast, but [I have spent time] on the rivers. Last year when I was working for Umiat, they didn't tell me but Umiat became a historical site and you can't take anything off of the ground. I found an arrowhead and I put it in my pocket. I showed everybody and they were like "No". They freaked out about that. I got kind of mad at them because I was like "Go ahead and put it back then or are you going to keep it". I found a pair of old metal binoculars. I had to leave them though. (Nuiqsut) (SRB&A Unpublished-b)

At Oliktok there are old grave sites. I think they have been covered by the gravel. It is a desecration. My grandfather was born and raised there. I am sure one of his parents or both are over there. (Nuiqsut) (SRB&A Unpublished-b)

Yeah, I say that now because of Alpine we have had some displacement of camping sites, fishing sites. Some families have abandoned because of the development. The impact of noise and traffic and the infrastructure itself the roads and facilities. They tell us we can use our camping grounds to hunt and fish but it's just not… And besides that with the fire arms these days the industry is wary of that. (Nuiqsut) (SRB&A Unpublished-b)

Yeah, that has a lot of history there. That was a route that the Barrow folks used when they went to the trade fair (unclear) site at the Nigliq Channel. So that, as well as that being a very sensitive area for the calving areas for the caribou, apparently, that's more or less overlooked because you're already talking of having a number of drill -- drill pads with 50 wells on them. (Anaktuvuk Pass) (BLM 2018b)

So we have on record, of people that resided there well before Nuiqsut was even there from -- from our people. It's on state record, also, of who was there. They have names and people and they're -- they're our direct kinfolk because they were our last names; people with our last names and our immediate kinfolks… I'm just asking, because we have kinfolk that are buried around that area there. (Anaktuvuk Pass) (BLM 2018b)

There used to be some people in Itkillik; there were allotments in Itkillik Lake. (Anaktuvuk Pass) (SRB&A Unpublished-a)

The nomadic lifestyle would have some activities over [in the project area]; there might be some grave sites in that area. The Inupiaq people would travel there, and when a loved one died they would bury them in that area. So the Alyeska pipeline might have affected some of that. (Anaktuvuk Pass) (SRB&A Unpublished-a)

We would find some old graves. A real long time ago, people would build [graves]. And they would start drilling and [find] some old bones. I said "2,000 years ago the last one was buried". There was caribou skin right there by the camp fire. I know over there in this area [gestures broadly to the map], it might be the same. They lived here a long time ago. This [TAPS] pipeline goes through the graves. During the starvation my wife's dad was three years old. He was three years old when he was starving there. People were right by the river and it overflowed in the winter. And that's where they found them [dead]. [speaking about the graves or bones by the rivers]. (Anaktuvuk Pass) (SRB&A Unpublished-a)

[Important places?] All the elders know, nobody else [knows about the burial sites]. People died in that area right there [west of TAPS]. When the person died, they called that area that person's name. [When a] person died there they called that place his name. [Do people still use those names?] More people [are] traveling over here because more animals are over here. Down, up, the mountains, and up and down. (Anaktuvuk Pass) (SRB&A Unpublished-a)

I travel all over place, what it is. [I] travel to the ocean from here. [I travel to the] Colville River. People from here and people from north they go right there [to the Colville River]. They make something down here they make something there, [and] they go and trade [these items]. That's how they used to be. There was no store here, it's a long way to the store. [We had a] dog team [in the] winter for groceries [laughs]. They know what month they [are supposed to] go to meet, [in the] springtime. They know where to find each other. Mostly the people live right here live here most of the time [in Anaktuvuk Pass]. People over there leave from Porcupine [to travel to Galbraith Lake]. It used to start a war, a long time ago. [If an] Eskimo find an Indian he [would] kill him. A very long time ago, [there was a] big war. Down south was the last time they had war. Only whites went back to Arctic Village. They made a story on a tape recorder. They said, "talk Eskimo so that they couldn't understand Eskimo". (Anaktuvuk Pass) (SRB&A Unpublished-a)

It's the same thing that can happen when the pipeline is open to the public; we know people have no sentimental value [when they visit] up here. But for us [this area] has a great sentimental value. (Anaktuvuk Pass) (SRB&A Unpublished-a)

3.4.3 Subsistence Uses and Resources

Key Subsistence Harvesting Uses and Locations

First of all I'm aware that Nuiqsut is greatly affected by these development proposals, but as he just showed caribou that migrate through Anaktuvuk Pass also travel up north to these areas and these herds are what our lifestyle here in Anaktuvuk is based on. And for thousands of years the animals that migrate north have followed their routes every year. These areas are summer home to the caribou, among other wildlife. The caribou that traveled north are the main source of subsistence for our people. Mike Morry. (Anaktuvuk Pass) (BLM 1998d)

Please stay away from the water. I don't know how many times we have to say it. These are the subsistence highways. Stay off the rivers and the big lakes because these are important areas for fish habitat that Craig just mentioned, and for waterfowl. Oil industry and water essentially don't mix. (Utqiaġvik) (BLM 2003d)

We rely on fishes from Teshekpuk Lake quite heavily. The amount of fish that is caught from Miuliak (ph) River as it goes to the Ikpikpuk River is very popular. I've been in the area most of my life and these in the summer months. When I'm hunting in the area besides Chipp River. (Utqiaġvik) (BLM 1998a)

That Anaktuvuk River, which is part of the, if that…lets take the Colville River, even west of the pipeline. Some of the project [components] get way up in here, and that effects the fish and the habitats for the animals that we eat here; the birds, the geese, and those kinds of things. Lakes sometimes are further up from the river, and human activity, I've heard this, that if the lake is kinda stationary and the river is not then that lake starts draining out, and human activities can do that. (Anaktuvuk Pass) (SRB&A Unpublished-a)

I use the general area around the Ikpikpuk up to Navy Creek for the last 15 years I hunted caribou and reindeer, there's a lot of reindeer up in that area. Fishers in the area catch reindeer annually. (Utqiaġvik) (BLM 1997b)

My favorite spot would probably be right in here [12-18 mile radius around Atqasuk]. If there's hardly any caribou up here, I head out there. That's when I need caribou. That's a go-to place. My favorite hunting spot. The caribou are the fattest right there. (Utqiaġvik) (SRB&A 2010a)

Wainwright, around Wainwright, the caribou seem to be fatter, less stressed. [I go there] in the fall time. Along the coast line all the way from Barrow, that's the one I prefer to hunt, the caribou seem to be fatter and less stressed because they come from the south, the ones that come from the east are bugged out. (Utqiaġvik) (SRB&A 2010a)

We utilize that lagoon every year. We go all the way up to Icy Cape, sometimes even all the way to Wainwright. You know, it's sort of like a somewhat safe trail in case the ocean is too rough to travel. We utilize that lagoon to harvest caribou along the mainland shore. We harvest off of the barrier island that is there. We harvest eggs,

which is going on right now this time of year. You know, we don't have to go to the store to buy eggs. You know, there is a wide variety of seagulls, geese, ducks, terns. (Utqiaġvik) (BOEM and BSEE 2013)

It's really more a way of life. As you know, subsistence is an unfortunate term, it's really a lifestyle. And gathering wild foods and that sort of thing, is, is super important in a lot of cultures, but definitely here. And you know you hear the cliché that whaling brings the community together. It's true, it really is true. It's amazing. People that have been campaigning against each other, all this kind of rough stuff, when a whale is caught all that goes away and food is shared. And that sharing hasn't changed. In fact, that is probably the single most impressive, or important, let's say, aspect of the way things are done here. Is that it's, it's sort of communal hunting. And the way people distribute food is really amazing. And you can tell it's absolutely genuine. (Utqiaġvik) (Brown et al. 2016)

People fish in Chipp River in the fall time. The fish spawn just before October, early October. Or maybe more like the end of September. The bloated fish with eggs all come together and you get lots of them. Then all of a sudden the fish get lean. They've dropped their eggs and they get skinny. I catch aanaakjiq in lakes in the fall and they have suvak. One time I got two that were just big and round with eggs. I was holding the fish and that suvak was just draining out of it. The lakes are connected during high water of break-up, but then the water drops and the lakes get land-locked. The fish end up land-locked, too. (Utqiaġvik) (Brewster and George No Date)

When you catch reindeer near Peard Bay, that's part of Wainwright's herd. When you go over here to Admiralty [Barrow], that's part of the Barrow herd. The reindeer Nuiqsut gets, that's part of Teshekpuk herd over there. (Utqiaġvik) (Mager 2012)

With hunters from seven villages taking animals from the Teshekpuk Lake caribou herd, it remains the most important herd on the North Slope from a subsistence standpoint. (Utqiaġvik) (BLM 2003d)

I hunt seals every summer. Eleven-Mile [Akunik Pass], and Five-Mile [Kukpowruk Pass]…around that area. We get ugruks outside Eleven [Mile], and here too; both places. Usually they hang around on the outside. When there's ice out here, they're all over. We go all over when there's ice. That area over there [Utukok Pass], and about this far [Neakok cabin], all the way up and down for ugruk. Outside [the lagoon]. About three or four miles [offshore]. (Point Lay) (SRB&A 2014b)

I got three of them [wolverines] and four wolves. When the caribou are close by the town, I usually come around here and here [Kokolik] and here [Kukpowruk]. You get them along the rivers, mostly. Just up in here [foothills around rivers]. Deadfall Creek, around the hills. Last time I was chasing a wolf, it was a three and a half hour chase; we chased it from the coast to the river. Probably here where the foothills meet the flat land. They're right in the foothills near the flatlands, up to Utukok. (Point Lay) (SRB&A 2014b)

Kukpowruk is the main river there. You can go all the way up to fish camp. I'm gonna guess it's…gotta be this one. Kokolik, just for fish. Those are the two good areas. Everybody makes holes for fishes between that area and this area. (Point Lay) (SRB&A 2011a)

[We harvest fish] in Kukpowruk at the cabin, and we go to the school cabin and to other cabins. We start at the cabin there. We do that river and the Kokolik River. You can keep going up and then up to the coal mine. [We harvest] grayling, trout, during the whole month of October. At the same time we hunt caribou, wolves, and wolverine. (Point Lay) (SRB&A 2014b)

[We go] pretty much all the way from here [Cape Beaufort] all the way up to Icy Cape. [I go by] snowmachine and boat. [I hunt] black brant, emperors, white-fronted geese, king eiders, common eiders, Canada, snow geese…there's one good spot up here, right here [inland on the Kukpowruk], for Canada geese. There's a whole bunch of migration routes that they follow [crossing the rivers]. Inside the six mile, 12 mile boundary, too, for eiders. (Point Lay) (SRB&A 2014b)

[The migration pattern changes] only when helicopters [disturb them] or young people get too anxious to get them. Usually they can pass right between the snow fences right there. If we leave them, the first bunch goes through. If we leave those alone, the caribou will follow the scent of the first. But some young people like to get too anxious for caribou and go after the first bunch, changing the migration route. We try to tell them [not to hunt this way]. (Point Lay) (SRB&A 2014b)

When they come up, we herd them to shore. We stay close to shore, not even a mile out. One time we did that from Utukok Pass. We herd them from there. Usually when we hunt them from the south, we take them through Kukpowruk Inlet, and when we bring them from Icy Cape we bring them in here [Akunik Pass]. One time we herded them from the ocean, eight, nine miles out. That was not that long ago. Usually we spot them from the village and hunt them from there. We used to use airplanes, the last few years we haven't but it is good to use the airplanes because they spook easy with outboard motors. (Point Lay) (SRB&A 2014b)

This past summer I spent most of the time in Fish Creek Bay. And also on the west fork [of Fish Creek], the one that comes in on the bay side. From here I took about 10 to 12 miles in [to Fish Creek]…. Caribou are out here [along the coast], but this bay is too shallow [so you can't reach them]…. But there were caribous around here, but you don't have access to go to them because the majority of this area is too shallow…. But I focused my camping out here [Fish Creek area]. Teshekpuk herd tastes better. I've seen caribou when I've gone to Oliktok, when I go to pick up my supplies, from Pisiktaġvik coming down. On the east side, we have caribou but it seems like they want to stay away from the shoreline [because] we have so much activities going on. Here I only got a few caribou because in summer we have so many activities going on…. Majority of the caribou were on this side [west] of Fish Creek…. [I went] about maybe four or five times out on Fish Creek. I focus on Fish Creek a lot because I know that caribous on this side are being disturbed by industry. That way you don't have a lot of choppers flying every day. (Nuiqsut) (SRB&A 2016)

…in the summer when it is time to fish for large, round-nosed whitefish the place called Tillabruaq gets filled with them as well as the entrance to Itqiliq. Nigliq river gets filled with nets all the way to the point where it begins. We do not go to Kuukpiluk in the summer months. Then we enter Fish creek and that is where hunting sites and cabins have been built. That is where they build racks for drying fish and for drying caribou meat. (Nuiqsut) (BLM 1998c)

That Fish Creek area is most popular fishing for Nuiqsut for the fall time. Summer time around Nigliq Channel. So it's most popular fishing. So if that's happened, if the oil -- if that bridge pipeline broke up, there will be more devastation on our fish out there, especially the seal on the mouth of the rivers. There's all kinds of seals out there, there's all kinds of birds. So if there's an oil pipeline break up on that bridge, boy, you're going to have -- devastate our wildlife out there. (Utqiaġvik) (BLM 2003a)

The reason I was disagreeing on the numbers is I have a campsite near the mouth of Fish Creek and I take my family there every summer, every spring, summer and fall. We geese hunt down there in the spring. We set nets in the summer. We hang fish to dry. All the time, we go caribou hunting for the prime caribou in the fall, the one that's -- that's the best time to get them, but during all those three seasons, I'm still hunting caribou, taking my family down. Now I've got my grandchildren I'm taking down this summer and we were down there a couple of years ago. A nice herd came through. We got a couple of nice bulls and I didn't see you down there and I'm just -- all these assumptions and these good numbers you're getting from a collar or two in the area, I just -- I just have to disagree with that. (Nuiqsut) (BLM 2014c)

The residents of Nuiqsut use Fish Creek in their subsistence activities. In addition Nigliq area is used extensively where they do their fishing and in the summer months when the fish enter it, fish nets can be seen all the way down. (Nuiqsut) (BLM 1998c)

We go here near the Kuparuk River and here along the Kikiakrorak and Kogosukruk rivers. That's where we go for furbearer hunting. If we don't see anything we'll go to White Hills. (SRB&A Nuiqsut Interview November 2005) (SRB&A 2010a)

[Speaking about the rivers he uses for subsistence hunting and fishing]: The principle one, of course, west of Colville that I used to pursue subsistence resources are Uglooktok (ph) River, Judy Creek and Fish Creek. Judy Creek. (Nuiqsut) (BLM 1998c)

What they said about fishing for whitefish at Kuukpik is true. While that is true, it is most true that another place where they fish for whitefish is Nuiqsaoruaq. You also know that from here all the way to the end of (?) those fishing for whitefish would fish from the frozen waters. (Nuiqsut) (BLM 1998c)

They'll go boating down towards the mouth of the river out to the delta at far as an hour out to the sea to get seals and things that are with animals or birds that are prevalent down there, but not old squaw ducks and those other little birds that were mentioned earlier. And sometimes when the route is good, they'll go to the Fish Creek and around -- and especially through the Nugaluk (ph) Channel for these things. (Nuiqsut) (BLM 1998c)

[The Teshekpuk area] has been used by subsistence hunters ever since he could remember. It's the area that when other areas within the close area of the villages like in Barrow, there's no game of any type, people usually go to the Teshekpuk area to harvest game that they don't have in the close proximity of various village. (Nuiqsut) (BLM 1998c)

Kowalski, Nageak, Obie (ph) all stated in the EIS that the Village of Nuiqsut hunt for fish and game at the Colville River. That is completely wrong because when the fish are there, all the way from where the boats are docking, that's down here. All the way down to the mouth of Nagaluk (ph) they put their nets. It's true that during the summer, that

(Inupiaq), they put nets there, yes, but for whitefish, this is -- this Nagaluk (ph) River is what they use the most. And then if they cannot do it there when the bay opens up, they go through the fish screen and use that area also for fishing. The Ulutuooh River which is really close from here and it bends like crazy like a snake, there's no fishing there. They don't I fish there. It's the Fish Creek area is what they use so everything that has been stated in that EIS is completely wrong. (Nuiqsut) (BLM 1998c)

Another thing that we have been given as the point that we can hunt for moose is the area at the mouth of Anaqtuuq. We have been told that we cannot hunt for moose past it. We cannot hunt past it, we've been told. When the residents of Nuiqsut begin hunting for moose, they are not able to get a moose right away and very often get a moose right at the end of the moose hunting season. The village of Nuiqsut is not like Barrow. When you live on the coast, like Barrow, there is a lot of game to catch. You don't have to travel very far either to catch it. That includes the geese, and seals, etc. But when you live inland, like Nuiqsut, you have to travel quite a distance to the coast to hunt...The hunting grounds extend all the way to Fish Creek. (Nuiqsut) (BLM 1998c)

For some reason our caribou on the west side didn't come. They wintered, summered, and wintered again in Wainwright. So the pattern is changing, maybe because of the industry is expanding and that's how we look at it. Because all this west side is undeveloped so why is that when you're supposed to be there, why aren't they? (Nuiqsut) (SRB&A 2014a)

To set our nets we have a tool that is a 15 –20 foot stick with a hook on the end. We cut through the first hole and then drop the hook with a weight attached. We move to the second hole and pull the rope using the tool in that hole; then move to next hole and pull the rope again, until all the holes have the rope connecting them. The net then gets pulled into the water and lies under the ice. Everyday we have to cut through the ice by hand to check the net; the thickness of ice is about 2 to 3 inches. This is all done in the cold, no tents and no warm-up shack. It takes one person 1 to 1.5 hours to perform this activity. The nets must be checked every day that takes about 20-40 minutes. Fifteen to 18 miles at 40 below and then finding one or two fish. It isn't fun after a while.

You can see the frustration; frustrated not only with industry, but the State and agencies, because, "How could this be happening to us?" We used to be a thriving fishing community. Now all of a sudden we get two to three cisco. It is very frustrating to an individual and as a family as well. You spend time and effort and money. The average family will set two nets, sometimes three nets to try to make up the loss of one net. It takes a lot of money to fish; prepare the snowmobile, buy gas and nets and you have to spend time away from your family and home. Our diet consists of 30-60% Arctic cisco. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

I just wanted to add in the 25 years I've been going to Fish Creek with my family and seen the caribous come and go, I've gone up the river all the way up to Judy Creek seeing caribou. I even got a couple of reindeer one summer and all these groups, even small groups, two or three, even larger ones, I've not once seen a collar on any one of them in the 25 years I've been hunting in that area and it scares me to think that the next generations with this GMT1 going up, are not going to be able to experience the good hunting that we have in the Fish Creek/Judy Creek area and I just wanted to say that now while I have a chance before this thing is over and I just hope you folks take that to heart if you have children or grandchildren, I would hope that you will listen to what's coming in the future. (Nuiqsut) (BLM 2014c)

Noise, Traffic, and Human Activity

They're too far out, too far from the rivers. Gotta be lucky [to get them] when they're migrating, but they never came through last year. Now they're over toward Atqasuk. There's none over there. People gone to Umiat and back around. Like I said they were at the dump for months. Traffic, when they start putting in all those ice roads, constantly going back and forth. The roads and stuff scare them off, the congestion and we have to go further to get caribou. Three years ago people were going 75 miles just to get caribou and that's ridiculous. Just the oil companies, the ice roads. I heard that's what's been keeping them away from town. Go back and forth on the ice roads, it's putting a hamper on it. Once the ice road gets built there's equipment and congestion, seems like they go further [the caribou]. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

Well, the wildlife, I think it's just the timing of the studies, the month of the studies has an impact. In the summer. Even the wildfowl notice, starting in May that's when they're really active doing their studies and that's a prime time when our local folks are trying to harvest their meat and they're being interfered by their summer activities. That's what it is. Just the changing of the pattern of their studies. (Nuiqsut) (SRB&A 2010b)

When I went camping last year, I waited 3 days for the herd, to have a helicopter to divert them away from us. When they were diverted, we went without. We have had to deal with harassment. We had overflights three times while trying to cut the harvest. It is disturbing. The next year we had a helicopter do the same thing, but it was worse. They were carrying a sling going from Alpine to Meltwater, another oil field. It went right over us three times. The herd was right there, and it put us at risk. I had my two young sons with me, and it made me very angry. What am I to do when the activities that have been handed down for thousands of years to our people are being changed by the global need for energy? (Mayor Rosemary Ahtuangaruak, USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

That would be a lot of people if they built the road, like the haul road. The haul road [was] not supposed to be open but for commercial drivers. But now it's open for everybody. Every year they go back and forth. Trucks, cars, everything. [There are] more guide hunters. (Nuiqsut) (SRB&A Unpublished-b)

We experienced four years of no caribou with -- because of aircraft noise, mostly with helicopters and our migration - Western Arctic Herd that came from the south was diverted inland to where for four years, we had basically no caribou and the caribou that we had were… Real skinny, no fat caribou and it was four years, you know, even -- even we got so desperate for caribou meat, we had -- some people went up to Icy Cape, even myself, and also we went up to Wainwright just to harvest caribou. (Point Lay) (BLM 2014a)

*Caribou hunting I see a lot of helicopters going back and forth and might change the migration of the caribou. Last year I was out hunting for two weeks and only got four caribou because of them. I don't know what they were doing. I didn't make them out but all the caribou were gone. (*Barrow active harvester; Experience timeline: 2006; Experience location: by Meade River. SRB&A Interview 2007) (SRB&A 2009)

They claim that the caribou herd is healthy with numbers, but the only caribou I got last year was bad. Twenty caribou were harvested in October when we could access

areas not accessible by boat. Seventeen were sick. When I went camping last year, I waited three days for the herd, to have a helicopter to divert them away from us. When they were diverted, we went without. We have had to deal with harassment. We had overflights three times while trying to cut the harvest. It is disturbing. The next year we had a helicopter do the same thing, but it was worse. They were carrying a sling going from Alpine to Meltwater, another oilfield. It went right over us three times. The herd was right there and it put us at risk. (Nuiqsut) (SRB&A 2003)

Last winter, nobody caught any caribou within 100 miles of this town because they were doing exploration on both sides of Teshekpuk and on the east side of Ikpikpuk. Last year, not a single one came through. They were all herded from the Ikpikpuk to Teshekpuk area toward Nuiqsut and Nuiqsut hunted them all winter. In Prudhoe Bay there was a union agreement that they could hunt wherever they used to - Nuiqsut - I'm using Nuiqsut as an example because they're right smack in the middle. This pristine land has been their hunting grounds. It starts from onshore and goes off. My dad was at Beechey Point. He was born there and grew up there. They used to pull up flounder and sole. The last time they tried that, 10 years ago, they hardly pulled up anything and they were very scarred and skinny. (Barrow active harvester; Experience timeline: 1996-2006; Experience location: Teshekpuk, Ikpikpuk, Wainwright, Atqasuk. SRB&A Interview 2007) (SRB&A 2009*)*

Don't follow the river. Because that is what they are doing. That is where the hunters are. That plane I wish and the chopper I wish they would reroute instead of following the river from Umiat. (Nuiqsut) (SRB&A 2010b)

It comes back to my whaling experience. Be quiet on the ice. No drilling on the ocean. It will affect us as hunter-gatherers. The noise drives the animals away. (Wainwright) (SRB&A 2009)

I heard they are always counting the caribou through helicopters. One time before Alpine had happened, they did a lot of caribou stuff by Piniqtuk and they noticed they used chopper and planes to scoot them away from the area where they planned to build Alpine. Then they say helicopters don't interfere with the migration. I think they always be together when they start coming in, the main herd that stay together. Then one lone caribou [makes it near Nuiqsut]. We always wait long time for caribou. Then July we're hungry because we got one in June, waiting for August. How we gonna get the meat from the store, it's expensive? $16 a steak. (Nuiqsut) (SRB&A 2010b)

[I] believe all of our caribou migration routes during the time that they are in their seasonal migration turn that those, those drill sites need to be turned off to allow our people to go out after them. Sometimes when you have too much loud noise during the caribou, they'll change their migration route and looking at the area of impact that our caribou are running through all that area I believe our caribou migration route should be protected. It needs to be logged and protected because of the decline in caribou. That's a resource that we use here every day on a yearly, we are every day, all year, 24/7. (Point Lay) (BLM 2019d)

Well the planes do come, but it don't scare them. No, the helicopters are the ones that scare the caribous. (Nuiqsut) (SRB&A 2015)

Hunting caribou; when we hunt caribou on the tundra where there are no trees, you've got to be very unobtrusive, there's nothing to hide behind. We were up at our camp, and

this has happened many times, were sneaking up on the caribou, and over a hill, bingo, there comes a helicopter; there goes the caribou. Same place, different time we went up there. There are signs all around that the caribou were there, but then there are ruts, deep tracked ruts in the ground where there have been vehicles, tracked vehicles. Caribou don't go where they've been chased out of. Over a couple of years, they change their activities. Same area, they have restrictions on activities, and some drivers didn't follow there where they were supposed to, and some broke through the river and spilled oil and left various foreign objects and never cleaned it up. That's part of why there's no fish there. About this time of year we'll take off on our snow machines and go wolverine and wolf hunting. Where do we go hunting? We go right here at Cape Simpson but there aren't going to be any out there. And what about all the money and time it takes to do this? I'm debating if it's even worthwhile. (Barrow active harvester; Experience timeline: Since 2000 and ongoing; Experience location: Chipp 6. SRB&A Interview 2007) (SRB&A 2009)

These caribou been so far out, so I started using four-wheeler [to hunt]. All these caribou start being away from the river. Last year, every time there's caribou, [they are]
away from the Colville River, about five to six miles. Some are close to the river sometimes....We got a cabin down here and caribou are way, way out here instead of close to the river. There's too much traffic. Airborne [traffic] is one of the problems we had. That really affects our hunting. (Nuiqsut) (SRB&A 2010b)

[I caught] less [caribou compared to the previous year], same thing – [it was difficult to hunt] with the helicopters and low flying planes. And there's actually rolligons that go, when we go up and Puviksuk there's one really big hill and we could see a whole bunch of rolligon trails. There were hardly any [caribou] up there. (Nuiqsut) (SRB&A 2014a)

Where the hunters are going out 30 miles to get caribou and a chopper that's doing study of the area tested by the industry, that industry will not take terms or responsibility for that impact. The State of Alaska, same thing, as well as the federal government. There are no mitigation impacts to these hunters, so therefore, you have a diverted caribou as well very interfered and upset hunters. It's been like this for many years. (Nuiqsut) (BLM 2004d)

Like I said I wasn't having any luck in this area [near Fish Creek]. I think it is because they were looking at GMT1 [surveying the area]. I got satellite collar imagery, and it is really familiar to – the caribou avoided the GMT1 area. They went around, it is because they are doing a lot of surveys over there. Helicopters. I've seen a lot of choppers inside Fish Creek. I ran into BLM out there. [The exploration around] GMT1 and Fish Creek are diverting the herd around their proposed development. The caribou are going south. A lot more activity this year, close to 1,100 Conoco Phillips helicopter flights. If you take a look a Cassin 6 and Cassin 1, those are wells, there is a big resemblance as to how and where the caribous are going. It has gotten worse. I can see with the caribou are not coming into this area. During the summer Conoco did a lot of studies over there. The wells, hydrology, UAF [University of Alaska – Fairbanks] is down there at Fish Creek, studying the fish. (Nuiqsut) (SRB&A 2015)

It was sort of like different from last year, for some reason they decided to go towards west side Harrison Bay area. That's what happens when they were being crowded by planes and helicopters. I think they [industry] are starting to understand that during

the migration of caribou, they're staying away [from those areas]. That was some difference we finally saw. Maybe that's the reason they [caribou] start coming through town. (Nuiqsut) (SRB&A 2015)

Also the helicopters – they are scaring off the caribou. We had to call the people around here and tell them to hold off the flight. They are always flying their helicopters around here [west of Nigliq, around the CDs]. I don't know [what they are doing] but they are from Alpine. Always out there from – well, out there year round. Well, summer time is the worst. They get water samples and stuff, and when it comes June for breakup, they always want to get water samples rushing from the rivers. It's already broken up and too much water. They always try and let the residents make money by guiding [them to those areas] but there is no way to get out there [poor conditions]. Planes weren't the issue this year for me, just helicopters. It was really affecting other hunters. (Nuiqsut) (SRB&A 2015)

Helicopter traffic. There was a herd that was coming from the east side going west and we were at our cabin on Nigliq Channel and when the caribou were coming in [closer to the cabin], a chopper flew over them and turned them around. At that time we were hunting for the blanket toss. Just when they were coming towards us, a chopper flew up and went straight towards the caribou. It was a blue and white one. My uncle was angry; he called them. He was so upset. It went right straight towards the caribou and it turned them around. That was in June. Just mostly helicopters. This year there was a lot of them. My uncle was sure mad when those got diverted. That chopper pilot knew it too. No they didn't care. No regards. A lot of people talk about that. Town folk say a lot that the chopper activity was really bad. (Nuiqsut) (SRB&A 2015)

They [oil company personnel] are all on this side of the river. If they put CD5 there it would be a big problem. That is right around the area that we hunt. (Nuiqsut) (SRB&A 2015)

I didn't notice at Fish Creek actually surveyors but they were walking. And they were just being picked up by helicopter at the end of the day those surveyors walk a good 30 miles a day. I see some people walking over there. A lot continuously all summer. (Nuiqsut) (SRB&A 2015)

A lot [of traffic] continuously – all summer long. It's the surveyors. They're surveyors out there. I don't know who they are, but all summer long they're just there. I think they're the ones – I don't remember the color – but I think it's the same helicopter that takes off and lands at Alpine all the time, but they're dropping off these equipment for surveying and bridge planning – whatever they're planning – to make these bridges for these roads. Basically at Miluveach, they're really utilizing that area to drop [supplies] off. They just so happen to utilize the area where the caribou are. Wherever they're setting their camps and drill sites is the best route [for the caribou]. When these animals travel, they travel on the lowest slopes possible and the most level, and where these people want to drill just so happen to be on a [migration] route. Right at the creek, and this is a flat area. You can see clearly for at least four miles; it's so flat, you can see as far as you want – but they basically use these two mounds for grazing areas; they're the feeding grounds, and when the disturbance comes they force them to go to Pisiktagvik and then Alpine. The helicopters are flying from Northstar to there. And from Oliktok to Northstar Island, the offshore drill rig. Every time that helicopter came in they just scare them around and the caribou move to where they left. (Nuiqsut) (SRB&A 2015)

I grew up as a hunter. I knew, back in the mid-40s there was not that much game at that time. In the late 40s the caribou showed up, so that's what we hunted. In Pt. Lay we did not hunt whales. The caribou would be real close, two to three miles. They'd come from the south and go north. Throughout the 50s it was good. People didn't have to worry. Going into the 70s and 80s, that's when we noticed the pattern of the caribou had changed. They came from the North. They went further inland. It wasn't just oil, but more snow machines. I think a lot of it is our own fault. We were always told not to shoot the first group that came through. Any disturbance to the first herd, whether it's hunting, snow machines, or any kind of activities, the first part of the herd determines where they go. I know this. We cannot force the animals to change their path. Not just the caribou. We hunt beluga by Pt. Lay. If we make too much noise, my dad says we should wait for them, instead of looking for them. The outboards will change their path until they get by Icy Pt. I strongly believe any kind of disturbance will change the animals' ways. The animals know when they travel year after year, where to avoid. The beluga, caribou, ugruk. If you disturb the first bunch, you can bet there will be hardly any ugruk. When the barges go through, they make a lot of noise. When the DEW lines first came in there were a lot of barges. We couldn't hunt beluga there. We had to go 30 miles south. We know now if there's no disturbance we should just wait for them. (Wainwright) (SRB&A 2009)

Now for the trapping people that are here -- where they make their livelihood -- they're going to not be able to trap at all in those areas that are designated for exploration. We know this for a fact because we're not able to trap around Prudhoe or any areas now being explored. Raymond Neakok. (Utqiaġvik) (BLM 1982)

It takes a long time for the tundra to grow all the way back. It will leave a mark. That is why they invented the rollogons to try and avoid the tundra damage. The rollogons will leave a mark in the tundra after the snow melts. (Nuiqsut) (SRB&A Unpublished-b)

I would say so [that TAPS has made subsistence more difficult], I have heard it mentioned from other elders and my grandparents. The people and the wildlife being displaces. Historically the Kuukpik people were nomadic along the coastlines. From the Brooks Range to the coast and east to west. We are settled now. We are here. We have the village here. Some of the campsites. I have heard of a couple of elders who were born in the Prudhoe Bay area. They grew up there and were raised there and tried to get allotments and somehow there was trouble with them doing that. Staking claim to those areas. I know that there is at least a family to two that tried that. I don't know if they were successful. Here I mean people aren't used to staking claims for their area. Game was everywhere. There would be 100 families who would harvest. You didn't need permission from my neighbor. You could camp and fish where you wanted. It was shared land, shared waters. Now we have to stake claim and tell people when they are trespassing. We still do that today; a lot of our campsites are shared. No one is ever really denied. (Nuiqsut) (SRB&A Unpublished-b)

Infrastructure

Pipeline has really changed our caribou hunting because Porcupine Herd used to cross the river, cross the road this way and come out to our Anaktuvuk and Anaktuvuk Valley from east, it doesn't happen no more. Once they build a road up here from -- from Alpine area to -- all the way across to NPR-A, once they build a road it's going to change the

subsistence just like every one of those coastal villages, if they build a road that's going to change their subsistence. (Anaktuvuk Pass) (BLM 2003c)

Pipelines; we have seen caribou turn back from pipelines because they [caribou] see a flash from the pipeline. They used to go to Helmericks' in the thousands, not any more. Maybe two or three or less. Especially females with young used to go down there. Westside at Kugaruk, Harrison Bay, there are caribou there. You always see them. We had to go out to the ocean and to Kugaruk to catch them. (Wainwright) (SRB&A 2009)

That migration pattern has gone southward. We hardly see the western herd this year. The Porcupine Herd, haven't seen them lately. We used to see thousands of Porcupine Herd coming through the villages, but we haven't seen those for a number of years and since that pipeline was built, that changed the pattern of the migration of the caribou. [We are] mostly harvesting caribou from Western or Central Herd. (Point Lay) (SRB&A 2014b)

The impact I would say would be the infrastructure. Caribou they like the pads because it is a sanctuary. They know they are not getting shot or hunted there. We spent a whole day just waiting on them to [cross over]. Right in Nanuq area. Some scattered caribou and wasn't large or significant. Three there, four there, one there, what have you. (Nuiqsut) (SRB&A 2014a)

I want to elaborate on ice roads that are used to connect ice pads. There were two pads that blocked the route to Kuupik from Oliktok to Amoniktuk through July. Usually these pads are completely melted and we can hunt seals. Generally we can take our boats and go across our hunting grounds but with this big iceberg in our way, we had to work our way around. Usually we have complete boat access at the beginning of July. Also when the cost of gas was $4.00, we used to go by 4x4 in order to travel to Oliktok to buy cheaper gas. When construction was taking place, they would push the snow into the roads that we traveled making it more difficult to travel. Within the Nigliq Channel we had to follow 7 to 11 miles of ice when we went out seal hunting. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

You present the socioeconomic aspects and the connection to subsistence, which they really understand and which I dealt with during my terms as mayor here sometime back. So I think, no question, helicopters, air traffic is the biggest disruption. So it seems almost like a no-brainer to be in support of the road project there and by the way, that spur road for Nuiqsut that Kuukpik had been -- their company had been working on was just permitted here a day or two ago. So that's what the community wants and I just want to echo and support their desire to be able to live off the land, considering development is all around them. (Utqiaġvik) (BLM 2014b)

Before I would go east of here but there is so much activity going on that I don't hunt that way anymore. Occasionally if I miss one I don't want a stray [bullet] going that way. We are allowed but most people don't hunt up there. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

While I -- you know, there could be impacts on wildlife through the area. I kind of repeat that the major impact will probably be on people. As you can look at the map, Nuiqsut is nearly completely -- will be completely nearly boxed in with the completion of this project. There's a huge area to the east that they don't use to hunt in any more because of all the development over there. The Alpine development interferes with people going

north. The first two satellites that will be put in will only make this worse; it will further interfere with people trying to go to the north and the later developments will kind of block them off to the west. So that doesn't leave them many more options, particularly if there are, you know, more satellite fields out there after these ones are developed. (Nuiqsut) (BLM 2003b)

...it's to look at what happened in Ukudu (ph) Bay in Kuparuk because that is a cumulative impact. The people of Nuiqsut don't use that area like they did in the past. And, you know, there is research that shows that. And what's happened there is going to happen here. So the people who use that area are fearful of that. So that is going to be an impact to all of us. You know, whether industry is very -- you know, you try to do it the right way, people aren't going to want to go hunting there. You might have access or the right to go hunting there but it's not -- you know, it's not going to be a favorable place because you let -- how many people from Nuiqsut want to go back and hunt in Kuparuk with all the pipeline, the roads, or go fishing near Alpine? You know, it's not a preferred place to go. And that's exactly what's going to happen in this area as well as -- the more it moves to the left, it's going to happen. And people are nervous about that, you know? People are. I hear people say, you know, I'm going to go out now before industry comes and enjoy it as much as they can before it comes to our area. So that, you know, I see that as something I want to have on record. (Utqiaġvik) (BLM 2004f)

We're getting to go further and further to catch caribou. Because their route has changed. They're not in our backyard. Now I have to go to other communities' backyards, like Anaktuvuk, Atqasuk and Barrow. Caribou you have to go out further because of seismic testing, helicopters, small aircraft. They'll be flying those choppers again. They'll be doing it soon when they gather information like when the ice goes out or when they haul their contractors out. This scares the caribou. What happens when the belt breaks on your snow machine? I walked 10 hours home once. (Nuiqsut active harvester; Experience timeline: since 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009*)*

Yeah, we can't go near the pipeline. You can't shoot near the pipeline. That's restrictive to the hunters. They always warn us not to shoot toward the pipeline or cross under the pipeline. So if the caribou are on the other side, they don't want us to go near it. You have to get permission from Conoco Phillips to go there. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010b)

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The pipeline. They say we can't hunt near the pipeline; most of the caribou are near the pipeline. We can't hunt with a certain miles of the pipeline. I think it's around here. We went through but they say if we catch caribou in there and get caught they'd give us a fine. (Nuiqsut) (SRB&A 2010b)

If they start making pipelines on land, we have to go twice as far. It's scary. It's an obstacle to us. (Barrow active harvester; Experience timeline: 2006; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

They're too far out, too far from the rivers. Gotta be lucky [to get them] when they're migrating, but they never came through last year. Now they're over toward Atqasuk. There's none over there. People gone to Umiat and back around. Like I said they were at the dump for months. Traffic, when they start putting in all those ice roads, constantly going back and forth. The roads and stuff scare them off, the congestion and we have to go further to get caribou. Three years ago people were going 75 miles just to get caribou and that's ridiculous. Just the oil companies, the ice roads. I heard that's what's been keeping them away from town. Go back and forth on the ice roads, it's putting a hamper on it. Once the ice road gets built there's equipment and congestion, seems like they go further [the caribou]. (Nuiqsut) (SRB&A 2010b)

Actually, with the Meltwater road on there, the caribou are getting lost. They don't know where the migration route is. We've got the Prudhoe roads over there, but the Meltwater comes farther down, and in the caribou's mind, where's the direction? We used to have the caribou coming into town, the migratory route [used to] come in, but now they don't do that anymore. (Nuiqsut) (SRB&A 2014a)

Although we will benefit for our economics, but we will benefit very little for our subsistence because of the pipeline and because it will up affect the caribou migration, it will displace -- may displace some of the nesting areas of the waterfowl, shoreline birds, that she mentioned from Cape Halkett around the Harrison Bay to Fish Creek and the Colville River delta. (Nuiqsut) (BLM 1998c)

Another area that is no longer accessible is Uuliktuq. Last fall because ARCO made Uuliktuq inaccessible, it took over one week to haul two whales back at Cross Island. That has made things very difficult for us. As a result they were brought back through a big aircraft. Uuliktuq had always been a place where our people left their boats after whaling because of the ice that usually formed making it impossible to return by boat. That is why they left their boats at Uuliktuq. Last fall they did bring their boats back. Where are they going to leave their boats from now on if they are not permitted to use Uuliktuq which had always been used? Right now the way it is, they cannot leave their boats at Uuliktuq. (Nuiqsut) (BLM 1998c)

I've traveled the haul road in the fall time the last three years, and I see more and more outside hunters. When I say outside I mean non-North Slope residents. The caribou seem to be less since that's happening. (Nuiqsut) (SRB&A 2013c)

With the ice road and the diesel, when they make a road, it goes through the land. I know they try to be careful, but the land is ruined. (Barrow active harvester; Experience timeline: since 2000 and ongoing; Experience location: Around Barrow area; Ualiqpaa. SRB&A Interview 2007) (SRB&A 2009)

Within the city of Nuiqsut you see all the activity of Alpine. The caribou migration has really changed over the last two decades. Our subsistence users have to go further for waterfowl and caribou. We've experienced this both on and offshore. Development really affects our wildlife. Our subsistence users have really had to change the last two decades. Much further to go for harvest. (Nuiqsut active harvester; Experience timeline: 1987 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

And the ice road does. When they melt and all the snow is gone you will see the grass and it is dead and flat. I have no idea why… Probably no oxygen getting to the ground

because of the ice… I think it must be from the weight of the ice too. It is heavier than snow and the trucks add pressure to the ground. (Nuiqsut) (SRB&A Unpublished-b)

… I think the gravel they have added on the tundra causes early thawing. But it is insulated by the gravel. At some point the gravel can sink and during the summer when it is hotter. She can only talk about Beechey point. She is going to give the young men a chance to talk about these topics. (Nuiqsut) (SRB&A Unpublished-b)

Contamination

They can leak and you don't see that until summer. The caribou then eats the moss. You won't know they're sick until you eat them and they taste funny. I tried to go caribou hunting and there was a pipeline. I had to use twice as much gas to go around it. (Barrow active harvester; Experience timeline: 2006; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

On- and offshore development are different. Onshore there is less chance for contamination because they can control it. We can live with it onshore and work around its effects on our seasonal activities. Offshore it is a hostile environment with moving ice and heavy seasons. It is very risky. If they invade our hunting grounds, that is not acceptable to us because of the risk. (Utqiaġvik) (EDAW Inc. et al. 2008)

I try not to hunt on Nigliq because a couple of them [caribou] hanging around CD4 have been sick – got pussy lungs and liver. They're abnormal. [Used to hunt near CD4] and every time I made my catch between here and Nigliq it was a sick one. (Nuiqsut) (SRB&A 2015)

Yeah, all of the caribou migrated through there. When I was a young man, I would wait for them there [near Fish Creek] with my uncle. Uncle used to say you go right at that point meaning at Nigliq. Used to be they migrated… even to Teshekpuk Lake. You know the caribou calving grounds, north of Teshekpuk… caribou kind of roam, up to the Brooks Range, up to Wainwright, this is the western herd…This is something else too. My own personal view is it because of the lights from the structures, the oil field infrastructure, and the smell. The smell from Prudhoe Bay, you notice with the haze that comes in. Those caribou have a good sense of smell. (Nuiqsut) (SRB&A 2015)

With the ice road and the diesel. When they make a road, it goes through the land. I know they try to be careful, but the land is ruined. The tundra is affected which affects the wildlife. When I've hunted caribou and am skinning them, I've noticed the meat is yellow. I've had to leave it there. It was due to the mosquitoes or to contamination. Sometimes the mosquitoes are so bad there are nests under the skin of the caribou which turns the meat yellow. (Barrow active harvester; Experience timeline: since 2000 and ongoing; Experience location: Around Barrow area; Ualiqpaa (Walakpa). SRB&A Interview 2007) (SRB&A 2009)

And the only biggest problem I have with that is you have 3 million gallons of gray water you dump on the ground now. And when you look at 3 million gallons of, you know, sewage and dish wash water, and you leave it on the ground, it gets pretty dangerous for the fish. The ground is very flat. We live in a flat ground and all the water that is put on top of the surface goes to the rivers. It works its way to the rivers and to the lakes. When I was young and being taught how to fish by my uncle up at the Chipp River, one time one of us washed our hands in the dish wash basin with soapy water

and we went down to the river and rinsed our hands in the river and for 24 hours we never got fish in our nets that day just from rinsing our hands in the river. That's how sensitive that Aanaaklliq that we catch, that white fish we eat. And you're looking at dumping 3 million gallons of gray water on the ground? (Utqiaġvik) (BLM 2004c)

As you all know we've had pollution that's been identified and that needs to be cleaned up, in part of the NPR-A I here's a rare potential pollution contaminating material that were buried by the Air Force, needs to be considered looking at too, the possibility of me whole Colville, cause of that possible of effecting all of our species, there's been some areas, you probably heard a couple, last year, they had found pretty close to over 30 moose carcasses that were unknown causes of death. And I'm kind of wondering if it's coming from that contaminated site. And these are some of the issues that need to be clarified before the proposed NPR-A lease. (Nuiqsut) (BLM 1997b)

The first cat train in the 1940s, from Barrow to Oliktok, they did not open drums with a bung wrench but with an axe; they pumped what they needed and just left them in the river or lake. That was how they worked when they first came here. (Nuiqsut) (ABR Inc. et al. 2007)

The ice trail they have is only one mile from our cabin and it goes over the river we fish in. That might be an impact for the summer. Lots of trash and traffic. We know which way the trail goes. We see it while we go for caribou. We see more trash on their trail. I've written to the Borough and BLM about it. Their rollagon trail from Barrow. In the summer it leaves marks even though they say it doesn't. After the snow melts you can see where they've been. They say there's no impact, but there is. (Barrow active harvester; Experience timeline: current; Experience location: Ice road from Barrow. SRB&A Interview 2007) (SRB&A 2009)

There are small creeks that tend to develop from an area where there's development. It gets higher, and from that high area, the small creeks tend to go toward the bigger river. And from the bigger river, out into the ocean. And one of the things he's concerned with -- that the water that the animals drink, the caribou and the foxes, the wolves, those that are on land -- if that water is polluted, the effect on the animals would be such that it would affect the lifestyle of the North Slope people. (Utqiaġvik) (BLM 1982)

And, this waste material that has accumulated, is quite a bit. We've seen too many caribous that have wires on their antlers. Some of them just die because they just happen to have a couple of them right around their feet our their legs, and a doggone leg drops off. I mean, these are the waste materials that we would like to be protected from as human beings and also for our animals which can not protect themselves. (Utqiaġvik) (BLM 1982)

One drum diesel, five gallon motor gas, they were floating down the river. Some changes in the 40s and 50s, there were lots [of changes]from the Navy explorations. Some of the buoys were left behind before they clean up that area. The caribou changed, and everything changed with the caribou. Notice that, I trace changes back to that. That's what I know happened. From Umiat. I think it was 15 years ago [drums floating down the river]. They been cleaning up slowly, but they're still out there. (Nuiqsut) (SRB&A 2010b)

I don't know how many more sites inside the NPRA that you guys have but if you're going to be doing any kind of oil and gas those sites need to be cleaned so that they can

be used later because those were original migration routes and this happened what, maybe seventy, seventy years ago, fifty to seventy years ago and they are still not cleaned up. There's still nothing done there. Um, when I traveled out that way maybe 2012, 2013 or 2012 there was a like a rut from barrels that were dumped there. I know that we're not part of the National Petroleum Reserve and we are looking for a water source. We cannot use these. This being one that we have because it had old metal and stuff dumped into it. I know that our waterways run all the way into this reserve and so Lapita is right. We need to be able to have these lakes open and protected for the water source. (Point Lay) (BLM 2019b)

In a sense, they feel like the oil companies are coming freely without rules or regulations guiding them, in a sense. These are things that were happening in state lands and one of the things that they saw the change in the environment was the development when they started going up toward Umiat to do their hunting in the summer and the fall time, they noticed that there was a lot of drums along the shoreline of the river that were floating down and sometimes, if they -- they found drums of fuel, diesel, white gas, gallons of -- one gallon and five gallons and this wasn't happening in just one season. It was a lot of things that were floating down and they think it was from Umiat because they started falling into the river from the oil -- whatever they did back in Umiat and I think they did a lot of things within that area. (Nuiqsut) (BLM 2014c)

Bilge water, that's a concern. We're totally against [drilling fluids]. Deck drainages, we're not that concerned about that. Blowout preventer fluid. When they were doing the Louisiana thing, it was a mud that thickened. All of this is alien to the area. I've heard horror stories about bilge water because it has other life in it. (Point Lay) (SRB&A 2011a)

That's going to be a massive problem, what they're putting back in the water after it's treated. Chlorine and caustic soda. They say it won't affect the water, but they don't know that. It removes the oxygen. What it does it kills the oxygen in the water, in the bottom. (Point Lay) (SRB&A 2011a)

If they're discharging, then let them look around first. There's always ugruks and seals that are curious and pop up to see what you're doing. A couple of ugruks keep popping up around us down at Omalik just to see what we're up to. We had four of them come up right next to the boat. I heard breathing and they went down. (Point Lay) (SRB&A 2011a)

Through krill and other small species, then to work their way up to larger species over time. Well the main thing I'm worried about is the krill and the small species. I'm not sure if that mud is going to be killing them off or poisoning them. Maybe they'll start feeding on the small particles on the mud that's being discharged. (Point Lay) (SRB&A 2011a)

We will have meetings and it doesn't change anything. Like at Umiat, they assumed 40 years ago that what we didn't know wouldn't hurt us but now it is all spilling out of the ground. (Nuiqsut) (SRB&A Unpublished-b)

Non-Oil and Gas Impacts

Fish and Game regulations don't help us. Moose season is too late so we can't get our boats upriver before freezeup. Guides and sport hunters from Fairbanks can fly in and

get the moose we need for meat, especially now that we can't get enough caribou. (Nuiqsut) (Brown 1979)

Once in a while we get these private planes or…other people from the other major hubs flying up here and taking the scenery route, doing something, taking pictures I guess. Those ones we can't stop. They don't get out, because they're, they're just somebody who owns their own Cub and just go take a joy ride up here. But we try to tell the airlines and everybody in North Slope Borough to help us printing those ads, just like to the airplanes or the helicopters. They need to start honoring that no fly zone. (Point Lay) (Braem et al. 2017)

[There is] less of a migration every year, because of those guide folks over there. I think there are two or three guide folks, and they are starting to [hunt] over toward the Galbraith [Lake] area, and sometimes [they go] to Shainin Lake with float planes. So if the caribou are coming from the pipeline area, as soon as they come down the hill they shoot them, and send [the second group] over in another direction. A few might come [toward the village], but most end up in the western area. Some [caribou] might [make it to the village], but there are less than eight years ago when we had assistance from Wainwright and Nuiqsut. The North Slope Borough chartered an airplane to get caribou down here; we had maybe 30 caribou for the whole community. Some years it gets to be that way…. Sometimes it would be super smoky, you can't see the mountains, and it plugs up the area. When [the smoke] gets just above the mountains caribou don't like [it]; I don't blame it all on guide folks. When there's forest fire smoke [the caribou] go [somewhere else]. It's always been smoky here. (Anaktuvuk Pass) (SRB&A 2013c)

Sportshunters. As a hunter we're already there to harvest game. Caribou may be coming toward us, and helicopters or small planes with sport hunters fly in and divert the caribou from their normal routes. They use our cabins; help themselves; then they hunt the caribou and don't take the meat or the skin - only the trophy rack they want. It's going to have an impact over time if they keep it up. If they were limited to maybe 10 a year (now they're taking 40 to 50 [total] caribou a year) it would be devastating! I provide for a lot of families, elders and widows, etc. Since the state allowed sport hunting we're fighting for our rights. We need bag limits to keep below the harvest threshold. We need to set a certain limit -- do drawings on caribou hunts like they do on bears. With sports hunters it's an attitude of have at it -- sport hunters don't have to deal with our extreme environment and over harvest resources we've preserved for thousands of years. (Barrow active harvester; Experience timeline: 1997 and ongoing; Experience location: Hunting areas on the North Slope. SRB&A Interview 2007) (SRB&A 2009)

You know, that's— but that Haul Road is open to public, so there's so much hunters over there. Now the caribou herd comes straight from over there and I don't see them. Like Porcupine Herd that used to cross, now they make separate herd, Western Herd. We depend on Western Herd and Central Herd through fall time. Western Herd we depend on, but I heard they are decreasing now. 400,000 to 200,000. We are not the only hunters. There are so many hunters to the north of us. It is open to the public. But we can't control it anyway. But we do depend on the fall caribou herds. They used to come right through our valleys. I hardly see them anymore. Now they go 30 miles west of us, maybe same distance on pipeline over there. Anyway, I wanted to bring that up. I subsisted hunt all my life. We still depend on caribou herds, but when I say that, it also—airlines, there is no road here, only airlines come through here. So everything comes through the air. Very expensive. I save too much time at meetings... If you had to

pay, that's what I witness. I have to pay $10 or more a gallon for gas, $21 for a quart of oil. Some young people or some people don't have a job. They can't afford it. White gas, $11-$15 a gallon. People don't have no job. It is hard for them. You know, I just want to bring that up. I witness that. (Anaktuvuk Pass) (BLM 2018a)

Sportshunters. As a hunter we're already there to harvest game. Caribou may be coming toward us, and helicopters or small planes with sport hunters fly in and divert the caribou from their normal routes. They use our cabins; help themselves; then they hunt the caribou and don't take the meat or the skin - only the trophy rack they want. It's going to have an impact over time if they keep it up. If they were limited to maybe 10 a year (now they're taking 40 to 50 [total] caribou a year) it would be devastating! I provide for a lot of families, elders and widows, etc. Since the state allowed sport hunting we're fighting for our rights. We need bag limits to keep below the harvest threshold. We need to set a certain limit -- do drawings on caribou hunts like they do on bears. With sports hunters it's an attitude of "have at it" -- sport hunters don't have to deal with our extreme environment and over harvest resources we've preserved for thousands of years. (Barrow active harvester; Experience timeline: 1997 and ongoing; Experience location: Hunting areas on the North Slope. SRB&A Interview 2007) (SRB&A 2009)

What I've noticed over the years, you know, we were taught by our elders to let the first herd go, the first bunch needs to go to make the path. Nowadays, once they hear about caribou, boats go out and they shoot whatever comes through. So we're kind of losing our -- what our elders have taught us to do. Some of our young hunters aren't allowing the herds to go through like they're supposed to and we can't force them. We can only tell them. (Nuiqsut) (BLM 2014c)

[I noticed] campers out there – other people, not local. Most people seen them with their loud jet boats and stuff. It was upriver somewhere, past Ocean Point, by Chandler. Like, I don't know how many miles, but somewhere around there, because when we were camping they were right there. Lot of noise, you could see caribou out there scouting on the hills, so they could hear the noise. The jet motor was loud as heck, definitely scared like three caribous away. (Nuiqsut) (SRB&A 2014a)

[There are] more activities. Planes [travel]back and forth [in the] springtime and summertime. That's when the people are hunting from the plane. [They come] from [the] Bettles area. [There is an] airstrip about 25 miles [away] and [people illegally] catch [caribou] down [near] Bettles. I called down Bettles and said "watch out for that plane, it's got [illegally caught] caribou". [There are] more guide hunters down there now, about 15, 20 miles towards Galbraith[Lake]. It's a long time [that they've been doing it]. They gave them permission to do it down there. We hate them though. They give out permits to make money. What do we get? Nothing. (Anaktuvuk Pass) (SRB&A Unpublished-a)

Legal or Regulatory Barriers

My concern is stray bullets. When I'm out subsistence hunting, I'm used to having a 50 mile area to myself. If there are 10 to 15 people in that area, that is crowded. I don't want to accidentally shoot someone. What if there are people on the other side of the hill and I don't see them? (Barrow active harvester; Experience timeline: 1990s; Experience location: Chipp River area. SRB&A Interview 2007) (SRB&A 2009*)*

Winter time we'd go toward the west side, because the caribou are coming in from the west, so over by Fish Creek. We'd be on the west side. All the way back to Fish Creek. The caribou come in from the west. The caribous are coming west from the coast to here and out in the Fish Creek, CD5 area. Caribou hunting in this area is tough, because most of these areas [north and west] are closed. You have to have a permit to go on CD4, Alpine area, so we go more on the west side. [We start hunting by snowmachine] winter time, somewhere around November. (Nuiqsut) (SRB&A 2016)

In addition, despite the relatively benign impact of the TAPS itself, there have been negative impacts that are not associated with TAPS operations along the Right of Way such as stressed public services and sport hunting pressure. The Borough is saddled with some of the TAPS corridor public services and the Mayor went into great length in describing these. Providing these services in a remote area that is devoid of permanent Borough residents is costly and difficult in times of shrinking Borough revenues. And when it succeeds in delivering these services, it seems only that it increases the influx of outside visitors traveling along the Haul Road who need even more support. So this is an undesirable feedback, effect, the more support we give to the Haul Road corridor, the more people use it, the more people who use it the more support they need. In addition, some visitors use the Dalton Highway and the associated airstrips to exert sportshunting pressure and produce other negative impacts that are not associated with TAPS operations. (Utqiaġvik) (BLM 2002)

We were able to hunt where the pipelines are and stuff. But now it's all built around there and our hunting lands is being diminished because of the pipeline then the oil field productions that are being up. And now I can't even go hunting over there 'cause I don't want to get in trouble for hunting near pipelines or where people are working. And even though there's caribou or animals around there, which I know I can go get, I don't go around those areas. (Nuiqsut) (Brown et al. 2016)

Beyond the dangers associated with the Haul Road travel are impacts to subsistence can be linked to that highway. While by comparison under normal operating conditions, the pipeline's impact are somewhat constant and manageable. The impacts of the Haul Road are largely dependent on traffic levels. More traffic generally means more impact on wildlife and to the North Slope residents. Since the opening of the Haul Road to the public subsistence hunters in Anaktuvuk Pass and Nuiqsut have noticed a decrease in the availability of caribou near their villages. Sport hunters and game guides using aircraft and off road vehicles cache supplies and use the road as a jumping off point to reach vast areas of the North Slope traditionally utilized only for subsistence by these and other communities. Competition for resources, disruption of subsistence activities and non-subsistence hunting practices which deflect animals from traditional subsistence harvest areas are a major concern. Without mitigation, these impacts will sure increase with the increasing traffic on that road. This is a very serious concern for those residents and more focus should be placed on scientific study and mitigation measures to address the village concerns. The village concerns of Nuiqsut and Anaktuvuk Pass. (Utqiaġvik) (BLM 2002)

Another big concern I have about any of the Plans is, if you build an industrial road within NPR-A, people are going to find a way to use it. You look at the Dalton Highway; when that was first built that was an industrial road and it was only going to be used for industrial purposes. Today it's a public road. And we have issues there where people -- we have competition for resources: sport hunters, recreational people, tourism, all that stuff is happening. And they want to even make it more accessible for people to

hunt from that road. And if you build a road into NPR-A, people are going to come. Whether they say it's an NPR-A -- or an industrial- only, it's going to change. I just know it is because that's what happened in the past with the Dalton Highway. (Utqiaġvik) (BLM 2004a)

Yeah right now it is difficult to go to Alpine because they have a buffer zone in that area where we can't enter within two miles of buffer zone and that impact the hunters too. Most of the time they used to be a lot of caribou towards Alpine but that has changed a lot. Too many [regulations]. (Nuiqsut) (SRB&A 2014a)

Safety/Security Concerns

Yes, [ice road activity] affects me. It makes me nervous at the same time. I don't like to shoot my rifle towards this. There's an ice road southwest toward CD5; that makes me nervous. I know there's traffic out there. I don't like to shoot my rifle toward southwest and even if I try to shoot that caribou, pointing my rifle toward southwest there's traffic, caribous, tracks, rolligons, you name it, it's out there. That scares me, makes me nervous. I always thinking about shooting my rifle northeast because there's less traffic. More traffic going southwest. On facing southwest there's more traffic. That make me nervous, super. There's people out there just traveling. They're walking sometimes, doing seismic. October, November, December. Rolligon, cat train. I look with my binoculars and see people walking. (SRB&A Nuiqsut Interview March 2009) (SRB&A 2010b)

And a lot of caribou this year was towards the Alpine side so I couldn't shoot or anything because the drill rigs and the pipeline there were very few on this side….I just don't shoot towards the pipeline. I'm not taking that kind of risk. (Nuiqsut) (SRB&A 2010b)

We don't go down that way to caribou hunt because of the pipeline in there; it is a big obstruction. A lot of times they [caribou] are on the pipeline side and we don't shoot. They [industry] tell us it is OK to shoot, but common sense says not to shoot into pipeline! (S.R. Braund and Assocs., 2003, Field Interviews, USDOI, BLM, 2004) (Nuiqsut) (MMS 2007a)

Yeah right now it is difficult to go to Alpine because they have a buffer zone in that area where we can't enter within two miles of buffer zone and that impact the hunters too. Most of the time they used to be a lot of caribou towards Alpine but that has changed a lot. Too many [regulations]. (Nuiqsut) (SRB&A 2014a)

We get these fliers in the mail about Alpine safety and it talks about using firearms around pipelines and all that other stuff. ConocoPhillips is always stressing that, so it kind of scares us off a little bit. I don't go over there [toward Alpine]. (Nuiqsut) (SRB&A 2014a)

My concern is stray bullets. When I'm out subsistence hunting, I'm used to having a 50 mile area to myself. If there are 10 to 15 people in that area, that is crowded. I don't want to accidentally shoot someone. What if there are people on the other side of the hill and I don't see them? (Barrow active harvester; Experience timeline: 1990s; Experience location: Chipp River area. SRB&A Interview 2007) (SRB&A 2009)

Yeah, we can't go near the pipeline. You can't shoot near the pipeline. That's restrictive to the hunters. They always warn us not to shoot toward the pipeline or cross under the

pipeline. So if the caribou are on the other side, they don't want us to go near it. You have to get permission from Conoco Phillips to go there. (SRB&A Nuiqsut Interview May 2010) (SRB&A 2010a)

Yes, [ice road activity] affects me. It makes me nervous at the same time. I don't like to shoot my rifle towards this. There's an ice road southwest toward CD5; that makes me nervous. I know there's traffic out there. I don't like to shoot my rifle toward southwest and even if I try to shoot that caribou, pointing my rifle toward southwest there's traffic, caribous, tracks, rolligons, you name it, it's out there. That scares me, makes me nervous. I always thinking about shooting my rifle northeast because there's less traffic. More traffic going southwest. On facing southwest there's more traffic. That make me nervous, super. There's people out there just traveling. They're walking sometimes, doing seismic. October, November, December. Rolligon, cat train. I look with my binoculars and see people walking. (Nuiqsut) (SRB&A 2010b)

General Resource Availability

And hearing that this impact is going to be more and more and more each year and each time is telling me I have to try 100% more harder to get food on my table. And I just keep wondering, how am I going to survive if these animals are being impacted? What is it going to take for me to make a supper? What is it going to take to find something to eat? And the animals that I depend on are being impacted and these are things that I depend on daily. And I just want you guys to know that subsistence is a big thing in my life and that's what I depend on each day to survive. (Nuiqsut) (BLM 1998c)

Go out further to get caribou. Gas costs more, when we first got here, we could walk across the river and get caribou. In summer we used to get lots, now only ones that come in are from the West side. (Nuiqsut active harvester; Experience timeline: Since 1998 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009*)*

So I have lived there and I'd like to know -- this is about the hunting area or fishing around Nuiqsut, especially on Fish Creek area. There's a lot of fish out there, especially Nuiqsut residents had used that for subsistence for more than thousands of years. Also around the east portion on this land where the Arctic ciscos are coming in through all the creeks over here. I fished with my mother for -- ever since I was a little boy. So there's hardly any Arctic cisco nowadays that used to be like 30 years ago. So ever since all this activity start happening around Alpine, the Nuiqsut have been impacted so much, by 100 percent, because all the birds that are around this area, they're nesting all over because I had experienced that before. I used to get a lot of Arctic cisco when I lived -- was a little kid with my mother, by hundreds and hundreds, and right now what my mother have been telling me, there's hardly any Arctic cisco nowadays ever since the Alpine has started about a few years ago. (Nuiqsut) (BLM 2003b)

We have to protect all of the moose as well. There's a lot of moose that come in and out of the National Petroleum Reserve all over and we're starting to see change in patterns of migrations and birds and in caribou and in moose. We've seen owls that never came this way, now they are migrating this way more and more and I know some of that might be due to the fire that they had down in the Brooks Range on the other side but we know that our animals are always coming this way for protection, same with your muskrat and our large squirrels. Our (Chikshukpuk? 37:24.19) is what we call them. They are starting to move and change their routes where they usually be. They are starting to

spread out. Where people used to never see them now, they are seeing them. So, any, any of those, any of our subsistence resource that we go off of I believe that they need to watch out for in the migration pattern of those species. (Point Lay) (BLM 2019d)

The caribou herds used to migrate through our village and now they migrate away from us. Last summer only three houses hung caribou. There are over 100 houses and most houses went hunting last summer. The offshore developments have caused problems with our fish. They are not coming. It's been eight years now. I know one family that hunted all summer, 80 days, and not one caribou. Where is the help for us when we go without? (Nuiqsut) (BLM 2003b)

3.4.4 Sociocultural Systems

Social Issues and Change Resulting from Development

Right after the oil boom. This is when I noticed the change. When I grew up people might have a drink or two, but not get drunk. Now we hear about meth, cocaine, and the small villages first. Our Barrow is the hub, then it spreads to the little villages. (Wainwright active harvester; Experience timeline: since 1972 and ongoing; Experience location: Barrow and North Slope villages. SRB&A Interview 2007) (SRB&A 2009)

I think about it a lot. I teach our history and when you understand what's happened in our past and what's happening today, it's cause for wonder. Socioeconomically, we've gone from a barter society to a borough that has been able to tax industry, until recently, when the life of the industry [has] now degenerated. It's had a lot of economic implications. When we go back to a traditional social framework that we loved 60 years ago, there's an increasing concern with dependence on government welfare. There's a lot of social implications associated with development that have been neglected. We've spent a lot of time, a lot of resources finding out what's been going on with the caribou, the whales, but not with what's been going on with our people. (Barrow active harvester; Experience timeline: 1945 and ongoing; Experience location: Barrow and all over the North Slope. SRB&A Interview 2007) (SRB&A 2009)

We have also spoken before about another less obvious category of impacts, these are the social and the cultural impacts associated with North Slope oil and gas activities that continue to affect our communities. They are not always specific to a single project or incidents, but can certainly be heightened by individual events. More continuously, these impacts reflect the cumulative level of industrialization that makes people worry and feel threatened by the effects of change. Over a relatively short three decade period of time our people have experienced changes, felt over perhaps 200 years by the greater American society. Despite the clear benefits with oil and gas development on the North Slope has generated, industrialization has also created the conditions for a whole range of anti-social responses to a deeply felt sense of loss. The stress and anxiety and the depression associated with dramatic change is evident in individuals, in families, and in the broader North Slope communities. George Ahmaogak, Sr. (Utqiaġvik) (BLM 2002)

Not long after that, we had another bad season when one of our whaling captains was killed. We sent supplies to Prudhoe Bay because if you do not bring it to the island, you go without. When the captain went to pick them up, the weather turned bad. The captain was lost after a conflict with the manager at the camp there did not know about our

lifestyle and us. The whalers were unwelcome at the camp and tried to return to the island, but they struck an iceberg and took on water. They called for help and they came with a helicopter to rescue them, but that captain was lost. The helicopter was not designed for the rescue. All the whalers came back to bury their fellow captain. The weather did not allow them to return to finish the season. Both seasons caused us to lose out on subsistence resources. The people were hurting. They had no jobs and they had no food in the ice cellars. They were suffering as seismic activity continued around our land and resources had gone with them. No alternatives; no income to buy from the store. I saw the effects of alcohol or drug abuse, domestic violence, suicide attempts and successes, conflict amongst the people with only a few jobs and every house had bills, but many houses had only one member working and most were seasonal short-term jobs. When the sun goes down in the north, the subsistence resources go with it. They may take many months to come back. The people suffered waiting for the sun to return and the subsistence resources with it. Some lost hope and they could not wait. (Nuiqsut) (BLM 2003b)

I guess I would have to say the urbanization of the Arctic. By that I mean, proliferation of roads, loss of language, TV worries me a lot. I've seen a huge change in community activities. Nobody walks; people are staying at home. The wildlife impact is more nebulous; my greatest concern is the impact to people. For example: When [I was] mushing from Barrow to Nuiqsut, I encountered a seismic crew on Teshekpuk Lake and they freaked out and said we had to divert 10 miles. That was a wake-up call. (Barrow active harvester; Experience timeline: 1993; Experience location: Teshekpuk Lake. SRB&A Interview 2007) (SRB&A 2009)

The communities are pretty much like a big family. When there's not much subsistence, when there are young men who can't go out with others, it affects them. They socialize the wrong way. (Barrow active harvester; Experience timeline: ongoing; Experience location: Barrow and other North Slope communities. SRB&A Interview 2007) (SRB&A 2009)

They're not here yet, but when they [oil companies] do [come], it'll be like Nuiqsut. There'll be roads to bigger cities. Then the wrong kind of things will come in like drugs and alcohol. It's starting now, even though we're not impacted. Once something gets started in town, we'll need more public safety officers. We used to get by with people hired by the city. Now we need training by public safety officers. (Wainwright active harvester. SRB&A Interview 2007) (SRB&A 2009)

With tourists videotaping us every time we go out. With the ice so close nowadays, I mean like three-quarters of a mile out with all that global warming or whatever. Now we're right off shore and they walk out there and videotape us. I don't like that. What if they twist it around and make us look like bad people? (Barrow active harvester; Experience timeline: 1978 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

My son's first harvest impacted by change, the loss of sharing that harvest within the family and the community, the joy of sharing a meal within the community, the joy of being recognized by the elders of our community. Those are losses that occur to our families. And these are things that are occurring on a daily basis. Rosemary Ahtunagaruk. (Nuiqsut) (MMS 2009b)

You see it. When there is an influx of money locally, there is rising consumption of alcohol and drugs. Where there is development, gold rush in Fairbanks, just like Nuiqsut, alcohol and drugs are readily available in the bigger picture of things. Who will be the people in power to solve [the problems]? Who will bend more backwards to oil development or subsistence? If there's lots of money, drugs and alcohol follow behind. Whether there is a conspiracy to bring in drugs and get them drunk up, who knows? That's in the back of my mind. How come it's so easy for drugs and alcohol to come in? Big money means drugs and alcohol. (Barrow active harvester; Experience timeline: since 1971 and ongoing; Experience location: Villages, Barrow, Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Drugs and alcohol, that's the worst part of it. It's expensive; $300 for a quart [of alcohol]. They made money bootlegging. When the pipeline started I guess, everything came from there. (Anaktuvuk Pass) (SRB&A Unpublished-a)

We were living in Bethel. We moved back to Wainwright. This is when I noticed problems. When there was lots of construction [and] we began to see drugs and alcohol abuse. The NSB has grants for suicide and drug abuse [treatment], but you have to be a real bad guy to get help. Lots of our young people do not know how to deal with these problems. Since the 1980s people have started showing disrespect. That's alcohol abuse. If we stay strong to our Iñupiat values. I do not want drugs and alcohol to overrun us. Our young people have to deal with peer pressure. The in-crowd. Listen to your heart, like I was raised. You may become a loner, but deal with it. We do not have professionals to deal with our problems. (Wainwright active harvester; Experience timeline: ongoing; Experience location: Wainwright. SRB&A Interview 2007) (SRB&A 2009)

The staging and mobilization for ice road building, the housing of drilling and construction crews in Nuiqsut, and general oil development and exploration creates multiple interrelated and cumulative impacts to our community. These impacts include more trucks on the community streets and more planes landing and taking off at the airport, pressure on the community's water and sewer systems, landfill, fuel storage capacities, and local clinic. The demand on the local services will increase as the five proposed satellite projects take place. Additionally, the supporting documentation for Alpine Satellite Development Program, production and project description, September 2002, mentions a very real possibility of ten future satellite projects within 30 miles of Alpine. The community disruption from oil and gas exploration and development leads to sociocultural impacts in the areas of our health, economic well-being, recreational activities, and the social and cultural structure of our community which deserves mitigating measures. (Nuiqsut) (BLM 2003b)

I've noticed a lot of people who have worked for Prudhoe Bay or in the oil fields have moved to Fairbanks or Anchorage. It's easier for them to transit. Easier for them to spend their money. The ones who go to college get job offers to work in Anchorage. I'm afraid they will not come back. We have a brain drain. (Barrow active harvester; Experience timeline: since 1995 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

Younger generations are leaving: They have no chance of making it, to build their own house and raise a family because costs are so high [here]. Anchorage is the place they are moving because it costs less. There is no way in hell I can live in Anchorage. I can take it about 10 days at the most. It's too fast paced. Younger kids won't really make it

here. (Barrow active harvester; Experience timeline: beginning in 2000 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

We're losing the younger generation and the traditional ways. The oil company jobs are good, but it takes them away from traditional ways. (Atqasuk active harvester; Experience timeline: 2004-2005; Experience location: Atqasuk. SRB&A Interview 2007) (SRB&A 2009)

The ills of alcohol and drugs. It comes into Nuiqsut through the Haul Road and through Alpine. It will hurt us even more if they build a road and start driving in. (Wainwright active harvester; Experience timeline: since 2005 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

My only concern is the impact of people that are going to be coming again. Not only will this public route be more impact for our situation, I think it's going to create more impact. I don t know that, but we will see. We know what the impacts are, socially it has had a great impact. Not only do we have a different outlook, but other things were created and we have to deal with it. You know, more drugs will probably be on the road. Use to be it was just alcohol, but not anymore. The drugs are light and not visible. I think that will create more problems in the long run. That's me observing. We've had the impact of animals, we say, the stopping of the porcupine herd, we don't see them ever. We only deal with the Teshekpuk herd, and occasionally the western herd, we get that, but not always. The one we are really concerned [about] is the Teshekpuk. It will be a real big impact if they are stopped. Like I said, at Nuiqsut you could see three oil rigs right from the village. Three oil rigs and one blew up about a month ago and people were sick for about a week. I don't know if we want that for ourselves. They were sick for a whole week. Whenever the wind blew from the north they got the fumes, maybe it reached us here, I don't know. It's natural gas, maybe we should worry about that. (Anaktuvuk Pass) (SRB&A Unpublished-a)

in 1973… when we first got here in 1973 social and economic was different we never experienced anything like that. Since Prudhoe Bay started expanding westward we see a lot of changes today. The changes have to do with the environment but it has also changed the pattern of the animals and the vegetation. To socio-economics has impacted the village. By the time they got to Colville Delta… we never had any social problems or economic problems when we got here in the early 70s but today we are experiencing lots of impacts from development gradually coming westward acre by acre and soon they are here and they are right there and we don't know how it will affect us when they open the west one. (Nuiqsut) (SRB&A Unpublished-b)

My grandparents would talk about displacement, hunting routes, campsites and things. I was heavily involved with Alpine as cultural Guardian for the city. Before that the Borough gave our permits and ASRC and the State did the same to the companies without talking to the village. They didn't even consider coming to a place like Nuiqsut until we changed it. Now it's a requirement. I know for a fact that since then and along the way the North Slope Borough had to change the ordinances and plan for that. (Nuiqsut) (SRB&A Unpublished-b)

There is a lot of anger in the community because of the pipeline. (Nuiqsut) (SRB&A Unpublished-b)

It is hard to compare, back then [when TAPS first came] they had cocaine, alcohol and marijuana. There are a ton of other things now including methamphetamines. I have had to take care of friends that were one it. It is not a good drug to get into. I smoke marijuana, but that's natural stuff and I don't have a problem with it. It's not like it was made with chemicals in the bathroom. (Nuiqsut) (SRB&A Unpublished-b)

It just got worse [as development increased]. When they first started [building the pipeline] it [the drug and alcohol problem] was ok but after the pipeline started working it just got worse and worse. These people are ok when they are sober but later on like sometimes like a year or so everything turns around and they go to alcohol instead of trying to get away from it. That is what they done so… it has been up ever since. There is no way of stopping it. (Nuiqsut) (SRB&A Unpublished-b)

when we first got here in 1973 people all pulled together happiness as here there was no alcohol. There were times when we had lots of activities going on when we were a tent city. We all worked together. We didn't worry about alcohol. People were subsistence and living together, working together. We had outdoor sports and people gathered together and had activities. It was going on for quite some time until one day all of this illegal stuff came in and the happiness was going down. We were rising and the happiness was on top and gradually it was going down. All of those activities that we used to have are not there anymore. We have no evening or weekend activities with our people. We don't have something to show to our younger generations or grandchildren. (Nuiqsut) (SRB&A Unpublished-b)

There is a big increase in the people using the area. There isn't a lot of housing around here and when one comes on the market it is too expensive for the local people, but the industry can afford it so they buy them and change them into offices. It bothers me a lot. (Nuiqsut) (SRB&A Unpublished-b)

There are big families all crowded into one house. There will be multiple families. They have money; they should just build their own buildings (the industry). (Nuiqsut) (SRB&A Unpublished-b)

Social Organization

Prudhoe Bay has drastically changed the political atmosphere of Barrow. Back when they were exploring, there was not political impact. The Inupiat pretty well had the governing, had the last say on political activities. But when oil was discovered in Prudhoe Bay, then everything changed in the governing scope in a short period of time. And everything that has materialized today is because of oil in Prudoe Bay. The Prudhoe Bay area was a haven for hunting in the past. Since the oil industry has become active, the traditional hunting grounds have not been available to the Inupiat people. This is the most impact it has had on our cooperative sharing. Jonah Leavitt. (Utqiaġvik) (Worl and Smythe 1986)

When they first started moving from Barrow, one of the things that a lot of the old people, and we heard this story before, but I'm going to retell it, that the elders that had moved away from there wanting to go back, back to their homelands because we remember that they told them that if the children didn't come -- take them to Barrow for education, that they would take them away. That's one of the reasons why all the people that lived down in this area went to Barrow back in the 1940's, 1930's, somewhere in there when a school started in Barrow and then when the Native Claims Settlement Act

started, they started their -- a lot of the elders that were taken -- to be home, wanting to go back home because they felt like this is their land and they don't want to lose their land and that's why Nuiqsut was restarted for the people that are wanting to go home and that -- those were the years that they stayed in tents for a year or many years.. and there was plenty of animals when they first moved because hardly -- the oil companies hadn't gone this far west and they were mostly out on the Prudhoe Bay area and there was a lot of caribou and the fish were fat in the Colville River. Then when we're talking about this -- the elders that have lived the subsistence way of life and not depended on store-bought food, they always prefer subsistence food, like the caribou, the fat caribou (speaking Inupiaq) that were available around here and things have changed and she talked about the glass - another thing that came from the gravel pit preparing for expansion of the industry and it was interruptions like then with the industry coming closer to Nuiqsut and now, come closer, they're catching fewer caribou. For her family, 10 caribou is good for the winter, but they couldn't catch any when they were flying planes all the time. They only got about two this year. When they (indiscernible)look back when the industry was getting closer and there were a lot of meetings like these, well, in a sense, not going to those meetings might have caused a lot of things to happen. (Nuiqsut) (BLM 2014c, 2014d)

Mixed Cash/Subsistence Economy

Impact mitigation funds from Pioneer and Conoco Phillips. That helps because if the helicopters scare our caribou further from here, like to Fish Creek, then that helps to go out there. We can get fuel vouchers from that impact fund, and once or twice a year they will give out a small check to the household, but you have to be an active subsistence household, not just any household; like the elders aren't active, but they have people hunt for them. (Nuiqsut) (SRB&A 2010b)

Subsistence lifestyle is priceless. There is no price to it, period. It's our livelihood, part of our culture. That has been passed on to us for thousands of years. (Nuiqsut) (BOEM 2011)

Having to adapt to a cash economy. Living in a capitalist world, you can't live without income. I've seen this more over the last 23 years. You hardly see anyone camped out all season like the summer gathering time like you used to when I was growing up. The whole family would spend the time out there. Making seal oil, drying meat, preparing for winter. Now most folks spend two weeks or a month at the most. We've had to find more full time jobs with less time to hunt. It's a gradual change. I guess it's normal for any society. (Barrow active harvester; Experience timeline: 1982 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

The gas prices are what really get us, we have to wait to get a paycheck. Some people would rather use their boat and wait for a later time, and us we don't own a boat, so we borrow one or go with somebody. (Nuiqsut) (SRB&A 2015)

It's just, the cost of living, high cost of gas, high cost of ammo, high cost of maintaining your snowmachine or boat…and it adds up…So, you spend $3- to $4,000 on grub, gas, and whatnot to go out for 10 days or 2 weeks to harvest caribou before the long winters and yet, you know, there's no caribou. You come home empty. Sometimes you just get a couple due to a lot of activities happening up here. (Utqiaġvik) (Brown et al. 2016)

It costs more to do subsistence activities now than in the past. So, in that regard, for an adequate comfort level to cover your costs, you work longer and take shorter time with your families. (Barrow active harvester; Experience timeline: 1995 and ongoing; Experience location: Barrow area. SRB&A Interview 2007) (SRB&A 2009)

The way I hunt now is much different. I need a snowmachine, four-wheeler, outboard. I used to need a dog sled and boat with a sail. If you don't have these things, you have to buy meat from your neighbor. Now hunters are more independent with fewer helpers. I used to take out five to nine people. Families and hunters are trying to be independent. You rarely see people out unless they are related to the boat owner. Wainwright and Pt. Lay are very lucky. Oil development is not here yet. Like Nuiqsut and Barrow, we've had meetings with oil companies. They're coming on our land and ocean. They did seismic testing last year. I did not see much effect on ugruk, but I did not see any beluga. (Wainwright active harvester; Experience timeline: 1954 and ongoing; Experience location: Wainwright, Pt. Lay. SRB&A Interview 2007) (SRB&A 2009)

These are some of the diets, our customary diet that we depend on, not just whales, but whales are one of the main species that we really depend on, and it's been known over 10,000 years, known that we have been whaling. It's been passed down from generation to generation. My brothers and I came from a big whaling family. As a matter of fact, came from a real subsistence economic. Our parents are gone now. Had raised 12 -- 12 children with no cash economic. It's been all subsistence, living off the land, living off the sea. And we are -- and they are gone now. And now it's our responsibility to continue keeping the tradition alive, and we are passing it on to our kids. That's how the chain -- the chain of -- the chain link occurs. When we are gone, they will still be here, even when the oil is gone, been extracted out. (Nuiqsut) (BOEM 2011)

There are people with no job, there are people that are with jobs, and it's just hard for people, you know people think of their families, of themselves, but they have their family take care of them. People that are working aren't there to fish and it just work both ways you could say. I'm a fisherman that goes out there and whenever I get the chance to go out there and fish, and I give it to people—to whoever needs. (Point Lay) (Braem et al. 2017)

Our subsistence is food on our table; if we start having to pay for licenses like it's starting to happen, then we'll need more money. I don't think it's right for somebody out of state to tell us that you need to have a license to hunt where you were before we were even born. I don't think it's fair for them to say that if you break that law, you'll be put in jail. We want our kids to have the freedom that we had. It seems like our freedom is being limited and we can't go back to what we had. Fuel is so expensive and you need a lot to do the hunting you need to do. And a lot of my relatives have a lot of kids and they need to put food on the table. (Point Lay) (SRB&A 2014b)

My grandfather sued the oil industry for trespassing on his Native Allotment. Many others of his generation had the same adversarial attitude. So people who looked up to my grandfather thought that this was the right attitude to have. So a whole generation of leaders grew up fighting industry, which was in some ways justified. There's a small group of people that were quiet and worked in the industry. Now our job is to put these young people to work and they're used to this adversarial attitude, it's hard. You ask if I know someone, whether it's a personal concern, it's everyone. Kids should be able to learn that they can work a rotational schedule, do subsistence, get benefits, and still be proud of their heritage and background. That's what industry should represent for us.

(Barrow active harvester; Experience timeline: 1920 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

When construction began on the NARL, there was a very definite change in the attitude of the people due to the introduction of employment to the community. You could really see a change in the cooperative sharing. [Illustrations?] Right after employment was introduced, everyone sort of abandoned the fur trading as a means of bartering for making ends meet. When everyone got jobs, things became easier. People began building wood frame homes, build some boats, outboard motors, etc. As things got a little easier, people started to stick to themselves around their immediate families since everyone was now in a position of self-reliance. So, at that time it became a little easier for everyone to look after themselves. (Utqiaġvik) (Worl and Smythe 1986)

[You have to make a choice between] having to stay home and going to work. Because you've got to have money to get your fuel and you've got to have money to get your food. In the old days, everything you depended on was out in mother nature. But now you've got to have money in your pocket. It's starting to change a lot. (Point Lay) (SRB&A 2014b)

The (indiscernible) Lakes, Pik Dunes, and those hills, we call them the Blue Hills up past the Kogohokruk River, are our prime areas that our young men go for wolverine, wolf hunting and trapping. And this is there for our traditional clothing, for our -- because this sustains our natural warmth in our body, when we have our traditional clothing. So it's for our tradition and culture. We do not want to -- if those become restricted and -- you know, we will lose our traditional way of life. You know, you start to make -- knit a sweater and you loosen one -- and now you're pulling it out from the seams. And now it's -- you know, we can't be bare naked in the Arctic Slope. (Utqiaġvik) (BLM 2004f)

There's people who have traplines, and it's just a matter of going out there in this cold because right now [February] it's the time of the year…it's the coldest time of the year and there's a very few people who go out and do it, because you have to travel miles and you have to go out and get these predators, wolverines and wolves. And it's just, you know, the excitement of getting them and bringing them home, actually getting these predators out there, that stuff we use to make our warm clothing, that's how it's been for years…you look back in the history and we had no stores, we had no way to buy up our clothing, it was out there for us to hunt, to make our clothing. (Point Lay) (Braem et al. 2017)

It is important to me because it was my wife and my kids' heritage. I tried to get in on as many activities as I could that involved that sort of traditional thing. [My son] is one of the better hunters and trappers in this community. And I was all for it, go with them, live with them, travel with them (his grandparents). It's the reason why people were here and it's a reason to stay here. (Point Lay) (SRB&A 2014b)

The person who is willing to work every day and passes his UA is willing to work every day. He wants to work every day. If he wants stuff he will work more. Alcohol and drugs will not help him make more money. The more money they want to make, there is a whole bunch of these kids I don't like, they make money all year long selling drugs and alcohol. They don't think of other people they only think of themselves and their own money. Why do you want to make more money, if you had a chance to do that why would you do that? I don't want to be like that, I want to make good money but not through

> *selling drugs. I kind of wonder about these drug and alcohol dealers. They make more money and more profit but they are causing problems. Everyone has got to work and make a living.* (Nuiqsut) (SRB&A Unpublished-b)

> *You will hardly see anybody doing seal pokes 'cause the weather warmed up too much, it won't let the seal oil render right—the way it's just traditionally been worked 'cause when it get too warm it gets rancid, strong. This cold weather we was brought up in the early '50s…I miss that a lot. 'Cause that food was staying fresher longer. Even our ice cellars held the food fresh longer. Nowadays we don't have ice cellars anymore 'cause they all melted. There's water and water gets in them and they get rotten and gaseous. People been known to have died from going in the cellars because of the gas that's produced like methane or whatever from the foods that rotted…we had to resort to electric freezers and walk in freezers. Temperature-controlled climate, however they might put it.* (Point Lay) (Braem et al. 2017)

3.4.5 Environmental Justice

See traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES, SOCIOCULTURAL SYSTEMS and ECONOMY sections for traditional knowledge that is also applicable to this section.

3.4.6 Recreation

Traditional knowledge holders from the six study communities generally do not consider their activities on the land to be "recreational." Therefore, see traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES section for traditional knowledge that is also applicable to this section.

3.4.7 Wild and Scenic Rivers

See traditional knowledge provided in the other sections of this report for traditional knowledge that is applicable to wild and scenic rivers in the planning area, particularly the Colville, Kokolik, and Utukok rivers.

3.4.8 Wilderness Characteristics

Traditional knowledge holders from the six study communities generally discuss "Wilderness Characteristics" in the context of their subsistence activities. Therefore, see traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES and CULTURAL RESOURCES sections for traditional knowledge that is also applicable to this section.

3.4.9 Visual Resources

> *I hadn't seen nothing, other than lights at night. Just when you're coming in from this side, you can see the lights; that's the only thing. [It can be] somewhat distracting – it's irritating. Because I remember on the blue moon days you can see Prudhoe Bay when I was a kid. [It is] hard to say if they caribou are affected. Normally if you see lights, you wouldn't want to be hunting in that direction.* (Nuiqsut) (SRB&A 2014a)

> *I still have a complaint [about the pipeline]: it is just too shiny. It reflects too much.* (Nuiqsut) (SRB&A 2015)

> *You can notice them [pipelines] from far away. Even from my camp I can see them [still shiny].* (Nuiqsut) (SRB&A 2011b)

I keep telling them that pipeline's got to be covered, because it's too shiny. They colored the one down by POW 2 - the one on the Oliktok Point - they colored that, and you can't see that one. It's like a dark green, navy color, army color. (Nuiqsut) (SRB&A 2011b)

3.4.10 Transportation

See traditional knowledge provided in the CLIMATE AND METEOROLOGY, VEGETATION, and SUBSISTENCE USES AND RESOURCES sections for traditional knowledge that is also applicable to this section.

3.4.11 Economy

See traditional knowledge provided in the SOCIOCULTURAL MIXED CASH/SUBSISTENCE ECONOMY section for traditional knowledge that is also applicable to this section.

Local Labor

People talk about the past and hunting with skin boats and dog I've never done that. I grew up at a life where I drive a snow machine. I drive outboard motors and four-wheelers to hunt. That's the life I know and that's the life my kids know. Nobody uses dog teams or skin boats to hunt year-round and where do I get that money from? My job, dividends from the companies that we're enrolled in [village and regional ANCSA corporations] and that's just for my family. What about the other hunters that I have to work with? That's where their income comes from, the North Slope Borough and that's how we live and that's the life we know and that's the life we have to continue to move forward. I cannot go back to dog -- I cannot envision myself using a dog team, let alone train a dog, because I don't even know how. I can train one to pee outside, but that's about it. You know, that's all animals are to us today. So I have to make up my mind and move forward and support projects like this that will benefit our people and not just us as Inupiats, everybody who lives on the North Slope, no matter what race, creed, or color they come from. That's the benefit of the -- of our system today. So we benefit everybody and that's why I have to support what we're doing here today. (Utqiaġvik) (BLM 2014b)

One of things that needs to be included in your alternatives is to see whether or not we can, economically, make Nuiqsut benefitted economy wise to create jobs. There's nothing. There's lot of people here that aren't working. They subsist, but we can't -- they can't go further out, because of their limited cash value that they have on hand. (Nuiqsut) (BLM 2018c)

I've noticed a lot of people who have worked for Prudhoe Bay or in the oil fields have moved to Fairbanks or Anchorage. It's easier for them to transit. Easier for them to spend their money. The ones who go to college get job offers to work in Anchorage. I'm afraid they will not come back. We have a brain drain. (Barrow active harvester; Experience timeline: since 1995 and ongoing; Experience location: North Slope. SRB&A Interview 2007) (SRB&A 2009)

I know they're always looking for qualified people. You need certification and lots of Iñupiat people are prepared for this. At the college we encourage them before they ever go get a job, they usually end up in laborer jobs because they're not prepared. They should notice this. (Wainwright) (SRB&A 2009)

Our younger generations are planning to move out because there are hardly any jobs. I have five kids of my own but one already moved out looking for a job. Oil companies

promise jobs, but they hire people from the Outside and don't keep the promise to hire locals. My oldest son went to Barrow for a job for three or four years. (Nuiqsut active harvester; Experience timeline: since 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

This doesn't happen to just the North Slope Borough. It goes right down to the families. If there is no work, it's the people who depend on oil development jobs who will be hurt. You hear this every year from the North Slope Borough. It'll affect everything we enjoy today. The revenues have been declining for years. They're laying off. People who thought they had jobs for life are unemployed. It's hard on the people. (Wainwright) (SRB&A 2009)

Alcohol problems. When you look at the people, right now I'm - have to deal with - without any federal monies, without no help, not from the churches, not from the state governments or from the federal governments - we have to deal with over 250 child cases every six months without no help, and a major portion of them is alcohol related because the parent's are worried about, 'Where am I going to feed my kids from? I can't find a job.' And we're sitting in the richest oil field in American. And major portions of our population are unemployed and can't get work, with the biggest oil field sitting right to the east of us here. George Edwardson. (Utqiaġvik) (MMS 1990)

Cost of Living and Economic Consequences of Subsistence Impacts

And then when the transportation to fly into a city, you don't get any discounts. You pay the price at price at all the time—the full 365 days a year. You know Alaska Airlines give out $76 one-way from Seattle to New York. We fly here from Fairbanks its $600 for a round trip. We don't get those deals. If some way, the state can help us to get some kind of deals. Everetts is trying, they are giving—once you reach Fairbanks that you'll be all right for a hotel. Which is highly needed because once you go Fairbanks, you are already spending your Christmas money and you go to a hotel. But Everetts is trying, they're trying they're giving once you land in Fairbanks, you're being delivered to a hotel for free and paying the taxes. We need to sometimes [unclear comment]. Give us a discount at Christmas holidays. WEIO. Activities that every community tries to come together and try to gather in one place. That was for transportation in that kind of way, maybe the state would have some more funding for the other people, people who don't have WEIO. Alaska Airlines does—give us some discount. (Anaktuvuk Pass) (BLM 2018a)

They changed everything in this area [TAPS]. It's not what it used to be. [It's] more expensive, more money from somewhere, especially groceries. You buy one loaf of bread it costs you six bucks. (Anaktuvuk Pass) (SRB&A Unpublished-a)

[It costs] 295 dollars for a bottle [of propane]. [The pipeline is] so close and yet so far away. We don't benefit from it. (Anaktuvuk Pass) (SRB&A Unpublished-a)

It's always been part of our whaling community. Due to our subsistence way of life, we try to avoid compensation from the oil companies. We deal with the IWC [International Whaling Commission]. If they see we get monetary assistance, it will impact us. I know Nuiqsut does, but they have agreements. I'm talking about Barrow. This is our livelihood. We don't want to lose this. Sure gas is expensive and the equipment. The cost is there. Each individual is burdened with the price of oil, fuel, and equipment. It's the same difference on and off shore. Most of these people fight for their subsistence. They

get seasonal jobs so they don't have the money for fuel and equipment. Due to the impacts that affect most of our hunters. In Barrow we see this with the whaling captains and subsistence users. When I go to my cabin I used to be able to estimate exactly what I needed for fuel. Now you can't because you never know where the caribou will be. The cost of fuel is not going down. You've got to understand. They don't look back once they pass a community. They look to the next. Once they're done they're happy. They say, ok let's move. We could use the economics. (Barrow active harvester; Experience timeline: 1965 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

When there are ships out there, you'll have to go further south to get your ugruk. You have to hunt ugruk in the summer to put skins on your whaling boat. When I have to change skins I will have to catch six the summer before I change them. You can't use the ones you catch a year or two before, they'll be rotten. It's expensive now. To get 10 gallons of gas you spend $45. Oil is another $30. The things the oil industry brought to the North Slope, more boats, more motors. You have to compete with that now. The things you buy up here are much more expensive than in Fairbanks or Anchorage. (Barrow active harvester; Experience timeline: since 1985 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

We recognize the importance of oil and gas development for the national need for energy, it's not that we oppose this, it's that we want development to be done in a way that's not costing to us. We have increased our distance of travel to try to attempt a harvest as well as the number of trips that we make to try to harvest. These are costs that come up on our families. Our families have to try to go without other things because we're trying to continue our traditional lifestyle. (Nuiqsut) (BLM 2004e)

The economy these days. We try to hunt. We got game coming toward us, then these planes, choppers fly over. It costs a lot. I spend $600 to $1,500 to go hunting for two weeks. Then the choppers fly over and the game gets scared off. It's very frustrating to come home with nothing. (Barrow active harvester; Experience timeline: 2003 and ongoing; Experience location: Peard Bay. SRB&A Interview 2007) (SRB&A 2009)

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Having to change my patterns of hunting and fishing. I had to change my calendar. I had to buy more gas and more food for my trips. I had to go to a whole new area. I

couldn't hunt and fish in the places I traditionally went. I have hunted in my traditional area all my life; now I have been approached by security and told that I'm not allowed to have a firearm in that area. That took a big toll on me. And in my house I found myself very frustrated and angry. And there's no counseling of any kind and no help. I found myself a very unpleasant person to be around. I had a good wife who told me that I would have to leave to get counseling and the proper help that I needed to learn how to deal with these problems. Then I tried to educate myself on the matter of development and learn how I can't stop it, how it's for the good of the country and how we will have to learn to live with it. I found myself reading EIS's constantly at work and learning everything I could. And then I became a local leader. You see, I grew up on caribou, whale, fish - hamburger was not available, but now I can't do that as much. I have less time and need more money to hunt and now my kids aren't learning the subsistence ways. It's not a priority to them. And that takes a toll on me. It makes me disappointed but not surprised that this next generation doesn't depend on subsistence. There is a lot of stuff for people to fight about. There's a lot of mitigation funds coming into the village and the North Slope. And for that money the people all fight. Local leaders, families, and there's controversies in the village itself. And there's no formula or method for resolving these problems. It's all new, and we're just still learning how to properly use these impact funds and mitigate. (Nuiqsut active harvester; Experience timeline: 2001 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

Using the vouchers isn't enough. If you're gonna divert our caribou, that 10 gallons of gas ain't gonna get us there. We're gonna go further out, got to spend more money on gas. Mitigation hasn't done nothing, since they're gonna divert our caribou further south. That's from the oil company mitigation, from the city [City of Nuiqsut]. Some of these mitigations are being misused. Given to non-hunters around here. They want to gas up their vehicle, not go out there [hunting]. Go to City and write where you're going and what game you're going for. Some of the non-hunters mistreat it. Last year they shut it down cause there was misuse. (Nuiqsut) (SRB&A 2010b)

We have increased our distance of travel to try to attempt a harvest as well as the number of trips that we make to try to harvest. These are costs that come up on our families. Our families have to try to go without other things because we're trying to continue our traditional lifestyle. (Nuiqsut) (BLM 2004d)

The scientists at the beginning of all this, you could subsidize your diet with food at the store. Heck, no, we can't. It's over $20 for a steak, $50 for a box of 20 bullets. If you're a good hunter, that's 20 tuttus. That's a lot of meat for them 20 bullets. But we can't find them. These roads, all that gravel hauling -- I haven't been able to get tuttu in two years. Myself -- for my kids, we're getting from son, my son-in-law. Other people are giving to us because we're unable to. (Nuiqsut) (BLM 2018c)

We go to the store on payday. It's six to eight hundred dollars just to feed our family. And we still struggle to get to the next payday after paying six to eight hundred dollars to them. We can't subsidize our diet with these foods, what they cost… You're running all our food off and you're forcing us to subsidize our diet with what's at the store and order from other places. (Nuiqsut) (BLM 2018c)

You can see the frustration; frustrated not only with industry, but the State and agencies, because, How could this be happening to us? We used to be a thriving fishing community. Now all of a sudden we get two to three cisco. It is very frustrating to an individual and as a family as well. You spend time and effort and money. The average

family will set two nets, sometimes three nets to try to make up the loss of one net. It takes a lot of money to fish; prepare the snowmobile, buy gas and nets and you have to spend time away from your family and home. Our diet consists of 30-60%Arctic cisco. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

When my mother and I go hunting, my mother always says, and I say, I think we need more meat because prices in our store are getting higher and higher. Hardly any jobs and gas is getting expensive. We decide to go get meat. And we go by boat for caribou and there is Alpine aircraft and helicopters flying over and it seems like they are disturbing our hunting. And all of a sudden a helicopter files over us and scares our caribou away. My mother gets so mad. It used to not be like this before Alpine came around. Alaska Airlines too. Alpine helicopters and Frontier Airlines. (Nuiqsut active harvester; Experience timeline: 1990 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

This is a true statement in itself. Some of our relatives don't make that much money so they cannot even go out to hunt. Quite a few people have had to make longer travels whether it's for consumption or clothing. We're used to going to a general area. Now we have to go out further because there are no animals in the general area. (Barrow active harvester; Experience timeline: since 2001 and ongoing; Experience location: 20-30 miles south of Barrow. SRB&A Interview 2007) (SRB&A 2009)

And things that will help to reduce these are looking at the pipeline routes, making sure that the pipeline is high enough that the caribou are able to migrate, that we're able to follow the migration and hunt without having to travel to an area that's designed to allow us to hunt through them. The cost of our travels come out of our pockets, it takes away from other things that our families need. And it's really important that the cost of trying to live our lifestyle is not taken from our families. (Nuiqsut) (BLM 2004e)

Most of the people who can hunt have to work. If the hunting is 50 miles out, I will not go. Even if there is an agreement between the workers and the employers. If the animals are too far out, people will not go. They have to worry about the job that puts food on the table. This is why you find people in town who've never had a permanent job. (Wainwright active harvester; Experience timeline: Since 1972 and ongoing; Experience location: Wainwright. SRB&A Interview 2007) (SRB&A 2009)

It's always been part of our whaling community. Due to our subsistence way of life, we try to avoid compensation from the oil companies. We deal with the IWC [International Whaling Commission]. If they see we get monetary assistance, it will impact us. I know Nuiqsut does, but they have agreements. I'm talking about Barrow. This is our livelihood. We don't want to lose this. Sure gas is expensive and the equipment. The cost is there. Each individual is burdened with the price of oil, fuel, and equipment. It's the same difference on and off shore. Most of these people fight for their subsistence. They get seasonal jobs so they don't have the money for fuel and equipment. Due to the impacts that affect most of our hunters. In Barrow we see this with the whaling captains and subsistence users. When I go to my cabin I used to be able to estimate exactly what I needed for fuel. Now you can't because you never know where the caribou will be. The cost of fuel is not going down. You've got to understand. They don't look back once they pass a community. They look to the next. Once they're done they're happy. They say, ok let's move. We could use the economics. (Barrow active harvester; Experience timeline: 1965 and ongoing; Experience location: Barrow. SRB&A Interview 2007) (SRB&A 2009)

3.4.12 Public Health

See traditional knowledge provided in the SUBSISTENCE USES AND RESOURCES CONTAMINATION, SOCIOCULTURAL SYSTEMS MIXED CASH/SUBSISTENCE ECONOMY and ECONOMY COST OF LIVING AND ECONOMIC CONSEQUENCES OF SUBSISTENCE IMPACTS sections for traditional knowledge that is also applicable to this section.

Human Health

> *I have been a health aid for over a year now in Nuiqsut. And it is a tough job and I know. And I have found out in one year, that on our little children and the older people, their hemoglobin has dropped way down. Some of the little children have to have two doses of iron. And it's really hard. And it's because we are so short on our caribou and all the animals are scarce. Rosa Kaigelak.* (Nuiqsut) (MMS 1979b)

> *Health problems. Thyroid problems. People are starting to complain about inner problems [like] asthma. Non-smokers too. Like my mother, her doctor told her that she should consider moving to where there's less development and better air. And this isn't from smoking. These health problems are between her family and her health. Should she leave the community and her family and her husband's grave? For her health? And we don't even have anything but a health aide here. When we came up with 15 people who have died of cancer, in the past few years, well, maybe something's happening here. I blame it on development. On the days when they have those flares from Alpine, my mother feels sick. And it's not just her. It's her peers too. It's not good for us, the people who live here, to have all that smoke in the village. The doctors don't know what's wrong with my mom. All the data doesn't match up.* (Nuiqsut active harvester; Experience timeline: 2005 and ongoing; Experience location: Nuiqsut. SRB&A Interview 2007) (SRB&A 2009)

> *I know our health care system can't afford the cost that respiratory illness is causing our region right now. This data isn't even there to fully assess how much our exposure is, because the data sets are mixed into a very difficult assessment process where you have to know who the people are, where you're reading it from, to know where to get the data sets from. Some of our information might be in the village, some of it might be in Barrow, some of it might be in Fairbanks, some of it might be in Anchorage, some of it is nonexistent, but the cost is tremendous for one person on a ventilator for a short period of time. Our village suffered 10 people at one time on a ventilator. That's a small village. Why? Why? Why? I still don't have the answers, but I'm still here asking these serious questions. I want to believe that not all my grandchildren will need inhalers to breathe because there are many that do and some of them are very serious. When there's flares that are going on and there's lots of them, those are hard days for people who have trouble breathing and it's serious. This is a drawing point in the sand. Clean up what you've already done before you get into this area because the devastation is going to be tremendous.* (Utqiaġvik) (BLM 2014b)

> *When I started as a health aide in 1985 I had one asthma patient. By the time I went to the University of Washington for my physician assistant certificate in 1989, I had 20 to 25. When I came back in '91, there were 35. When I quit in 2000, there were over 60. The village make-up has not changed; it is still mostly Inupiaq. What was contributing, the most overwhelming issue, was that oil development around the community had increased and gotten closer. The worst nights on call were nights with many natural gas flares occurring. We could see it in the flares or in the fields around us. They release particles*

and they travel to us. The chance of an inversion will affect us. An inversion is a bowl-like air trap with cold air trapped by warm air. Increased concentrations of particulate matter occurs during these episodes. (Nuiqsut) (BLM 2003b)

Oil and gas. I think that that onshore development definitely has some issues with the resources. They use our lakes for water to build ice roads, and there are just a lot of little things that can add up to make the caribou have sicknesses. I've helped with little spills and I know they have that. It's the same thing with our humans. I can guarantee that at least 10 of my elders passed away from cancer, we had some from heart attacks, but at least 10 from cancer. I think it might be the air pollution, it might contain small particles, but it adds up. That one with the tumor, I cut off the head and took the horns, but I left the rest for the animals to eat, cut the gut open so it wouldn't explode. (Nuiqsut) (SRB&A 2010b)

I'm concerned for our health too. You can see those flares for miles. What they're burning is, I think unwanted gas and it's harmful to us humans over here in the village and the animals too. I just see that smoke from miles away. Alpine's north and a lot of time we have north, northeast wind in the village here. It's not good for us when they burn. (Nuiqsut active harvester; Experience timeline: 2004; Experience location: Just up the river. SRB&A Interview 2007) (SRB&A 2009)

Other factors that need to be looked at are unknown toxins. Take samples at the DEW line (old military sites) along the coast at Oliktok Point. When we first came in 1973, there were so many barrels and debris scattered around. There was a lot of dumping early on that was just buried over and now this has created a problem with the onset of erosion. I think these could be some factors affecting the water. (Nuiqsut) (MBC Applied Environmental Sciences 2004)

So we don't have good data sets to know what are all these things, but I know we have a tremendous amount of asthma. We have a tremendous amount of diabetes. We have a tremendous amount of heart disease. We have a tremendous amount of obesity. We have a tremendous amount of thyroid disease. These are all different things that are happening to our people, without the studies to assess what's going on, but we have only one industry that are contributing tons of emissions to the air that we breathe, the animals that we depend on, to the waters that we feed our families from and that we feed our -- we give to our families to drink, to bathe, to hunt, to fish in. (Utqiaġvik) (BLM 2014b)

I know our health care system can't afford the cost that respiratory illness is causing our region right now. This data isn't even there to fully assess how much our exposure is, because the data sets are mixed into a very difficult assessment process where you have to know who the people are, where you're reading it from, to know where to get the data sets from. Some of our information might be in the village, some of it might be in Barrow, some of it might be in Fairbanks, some of it might be in Anchorage, some of it is nonexistent, but the cost is tremendous for one person on a ventilator for a short period of time. Our village suffered 10 people at one time on a ventilator. That's a small village. Why? Why? Why? I still don't have the answers, but I'm still here asking these serious questions. I want to believe that not all my grandchildren will need inhalers to breathe because there are many that do and some of them are very serious. When there's flares that are going on and there's lots of them, those are hard days for people who have trouble breathing and it's serious. This is a drawing point in the sand. Clean up

what you've already done before you get into this area because the devastation is going to be tremendous. (Utqiaġvik) (BLM 2014b)

There's a lot of social and health impacts because we're connected to the food chain and we eat the fish and caribou and, you know we, for the past 2–3 years we've been having the fish crisis, we're getting more fish that are being sick. I know of an elder family that don't even fish in the rivers no more they now go to the lakes because they know the river's contaminated by the legacy wells that eroded into the river by Umiat coming down and coming from up river going down to the ocean. (Nuiqsut) (Brown et al. 2016)

Like maybe there is something we have to do to protect ourselves if there is some type of adverse event, if there is gas in the air or drilling mud. And you know, the drilling mud has chemicals in it. and It sits there, but it dries up pretty easily and it can easily get into our air. It can get turned to dust. And that, because, you know, it is so windy it can dry pretty fast and you know, particulates from that dust can get in the air and that can really affect a lot of people's respiratory especially around here, people have– they are more susceptible to respiratory issues because of that. And there's a lot of people that have sensitivities, they have asthma, the have… you know. Some people are more sensitive to those kinds of things. And the younger they are, and the older – the risk is even more. (Nuiqsut) (BLM 2016a)

I have a concern on air quality too, we've had concerns on the Alpine and we didn't know how much of a concern it was until Alpine came out of what air quality, that's going to be a major concern for the village, we've seen some gathering stations in Prudhoe where they pollute quite a bit, especially during the winter where it's real visible, so that's going to be another real concern of the village is air quality. We have quite a few numbers of children with asthma and bronchitis cases and we still haven't figured out exactly where's that coming from and how's that affecting the village, it's not only children, it's adults as well with bronchitis and asthma that didn't occur, these disease until later in their lives and that now occurring in Nuiqsut, most of these cases, so air quality is a big concern of mine. (Nuiqsut) (BLM 1997b)

And when you look at the cause of death, you will see a lot of suicide. And if you want to know why there is suicide, let me tell you something. These Elders taught us, you know, how we lived, who we are, and how proud we are supposed to be. Taught us how to hunt. And then these children of ours get big enough to go do that, what do they run into? State law that says no, federal law that says no, oil development that have destroyed the land. This is the reason for suicide amongst our young kids, something that should have never happened. We can't stop it. All we can do is try to teach them how to be proud of who they are. (Utqiaġvik) (MMS 2009a)

And I'd just like to say that, you know, with the air emission, the air quality, it is not being analyzed. It's not being looked at. We have a lot of people with chronic illnesses that is being ignored. A lot of lung disease that -- that -- that federal, state government and other agencies have not even looked at. (Nuiqsut) (MMS 2009b)

When you look at the North Slope, we have the highest suicide rates of our youngsters. I lost two of my brothers. They both worked in the oil patch. One was a truck driver. They couldn't take it anymore and they both killed themselves. I can't afford that. I've got kids. When you teach a child what kind of culture and what kind of things their ancestors did, you can go into any village and you will end up with the same story.

Teenagers, some of them in their pre-teens. You show them the longest lasting culture and they get to watch it die in their minds. I'm not worried because it's not going to die, but they don't know it. There's not one family who hasn't lost someone like that. There's going to be a dying peak in the next three to four years (of elders in the community). There was no oil and gas when I was valedictorian. I learned what I was taught. (Barrow active harvester; Experience timeline: since 1971 and ongoing; Experience location: The whole state of Alaska. SRB&A Interview 2007) (SRB&A 2009)

The worst part of it is, is the social disruption that occurs to our families. When you have the young hunter that's gone out and now this $10,000 snow machine is broken and the parts to replace it cost $500, but it costs over $100 to even attempt to go out to do a short hunt, it's tremendous impacts to what we're thinking about, but when you have those young men commit suicide because they can't find a way to understand the changes to our lands and the changes to our way of life and the value they are felt (sic) as hunters to our village, it's a big problem for our whole community. When our young hunters see the infrastructure and they can make the logical decision that it's not logical to try and go out into traditional lands because you can't harvest in the way that our elders have taught us to. That's tremendous impacts. (Utqiaġvik) (BLM 2014b)

There's no way for people to be protected from the air pollution. Its ultra fine particulate matter from these diesel exhaust emissions from all these drilling rig emission. All the big risk that's coming from oil and gas development rigs catching on fire or, not just the rigs, the chances for that—explosions happening. Cranes and equipment catching fire. All of that happened last year. There was, you know, a crane caught on fire and it was near the pipeline. What chances of that happening for a pipeline explosion are great, the risks and the chances are great. Yeah, for what little resources they want to get from the oil and gas underneath. But the chances of the oil still happening and the risk of all the air pollution greatly harming the people, all of that—those are not being monitored. All that always ozone being created—the warmer temperatures being created from all of this oil and gas industries are creating warmer temperatures. All those warmer temperatures are increasing all the ozone in the air and they say, well, there's not very much ozone and what they don't even monitor for it. They don't even put it in their analysis. How much of that ozone is in our air and it's affecting our children and is affecting our elders? It's affecting people's health. And they're not even trying to even acknowledge that. There's not even a working system for the state of Alaska or the health department or the planning department or the North Slope Borough to even come together to even understand those issues of the health impacts. (Nuiqsut) (BLM 2019c)

Like maybe there is something we have to do to protect ourselves if there is some type of adverse event, if there is gas in the air or drilling mud. And you know, the drilling mud has chemicals in it. and It sits there, but it dries up pretty easily and it can easily get into our air. It can get turned to dust. And that, because, you know, it is so windy it can dry pretty fast and you know, particulates from that dust can get in the air and that can really affect a lot of people's respiratory especially around here, people have– they are more susceptible to respiratory issues because of that. And there's a lot of people that have sensitivities, they have asthma, the have… you know. Some people are more sensitive to those kinds of things. And the younger they are, and the older – the risk is even more. (Nuiqsut) (BLM 2016a)

A lot of people have been getting sick from the air lately. There are a lot of people that have been getting bronchitis and pneumonia for how many years. My buddy worked

with the air quality people over here and he put out air canisters. He is still waiting to see the results of the air quality out here. (Nuiqsut) (SRB&A Unpublished-b)

She has noticed a change in the air as the industry was working westward. None of our people got sick and no one experienced any strange odors. We noticed our air started to change. Today the air has changed a lot. The air is blowing towards the village and today we are experiencing the problems with Alpine too. The blowout has really affected the village big time. (Nuiqsut) (SRB&A Unpublished-b)

I've been here -- a resident since then. I've seen some changes since I've been here, and mostly in the air quality portion. There's a lot of air pollution coming from a lot of this exploration and developments that are going on, especially with oil and gas industries. There's a lot of risk that come with the oil and gas industries in -- in our area. There's a lot of risk of blowout, fires, and a lot of hazardous air pollutants that are being produced from all of these developments with the flaring going on, with a lot of things going on here, especially with utilizing a lot of diesel equipment. There's a lot of diesel exhaust being produced. And a lot of the times, these diesel vehicles will be parked or running and idling and they'll be producing a lot of emissions, and it's at a ground level. This is where we breathe. A lot of our people are being impacted health wise. There's so many health problems that come with breathing in oil and gas development emissions, especially even from the diesel exhaust. Brings on cardiovascular health issues. It brings respiratory health issues to our people here. (Nuiqsut) (BLM 2018c)

If you talk to the elders every one of them takes oxygen. I don't know why, some of these elders can't breathe sometimes. It makes me worried. What happens if that blowout air comes over here? There are going to be a lot of sickness that comes from that. (Nuiqsut) (SRB&A Unpublished-b)

Sharing and Community Networks

Our Inupiat way of life is centered around sharing what food is available. We also exchange fish with other villages of the North Slope so that, in return, they may send us what they have that we don't have. The stores supplies only supplement food like milk for the babies. The main plane that carries our supplements does not come in for weeks in the wintertime when the weather is bad. Trisa Hopson. (Nuiqsut) (MMS 1979b)

And we support the villages up north, like Nuiqsut I know they will also have that problem like we have had in the years since the pipeline had come. And if those other villages stop having caribou too, when our caribou doesn't come around those villages up north they gather up money somewhere to bring us caribou. They go out hunting and take just caribou to bring up here because that's the only food we eat up here. We do eat fish, too, but we only have little graylings in our river. And they're usually easy to catch around last part of July and August in our little river. Delia Ahgook. (Anaktuvuk Pass) (BLM 1998d)

The other thing is, we share our food. I just sent over 3,000 pounds of Arctic cisco to Barrow to Wainwright and that's every year. We share with family across the North Slope and that's going to affect not just this community with our Arctic cisco, it's going to affect the North Slope. (Nuiqsut) (MMS 2006)

No, not enough. One caribou will feed your family but you got to worry about other families too. If you catch one you can't just keep it, so you have to share it between

households. I would say about 10 [caribou is ideal]. Yeah – 10 or 12 [caribou], that would be enough to last all winter. When you haven't had it in a while and someone brings it over it is so exciting, when someone brings it over it is like a delicacy now, it is like a treat now. Caribou are so hard to find now, it is such a treat. When you catch one it is gone in a week because you are sharing it between so many families. We all watch out for each other when it comes to caribou. The other day a buddy of mine dropped off a caribou. There were 13 of us living in my house, so that one caribou went a long way for us. My kids, they love it. When you cut it up they can't get enough. (Nuiqsut) (SRB&A 2015)

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